MAJOR SERVICE MANUAL

FOR

YD

GENERATORS AND CONTROLS

4.5 KW-17.5 KW

(USED ON J-SERIES BEGINNING SPEC. AA)

- DESCRIPTION
- OPERATION
- ADJUSTMENTS
- TESTS
- TROUBLESHOOTING
- CHECKOUT

WARNING

TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, A QUALIFIED ELECTRICIAN OR AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM INSTALLATION AND ALL SERVICE.

900-0184
PART 2, SECTION 7
MASTER SERVICE MANUAL

1075

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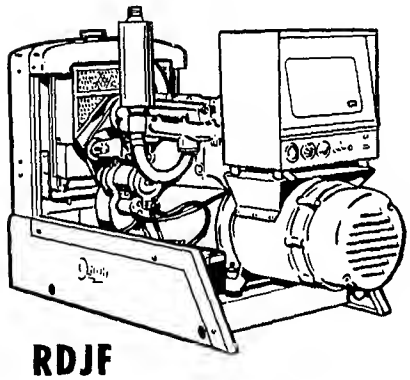
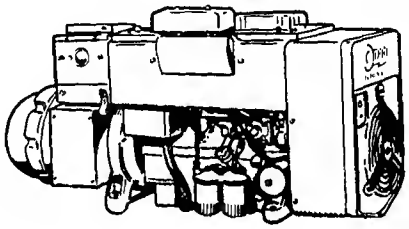


RDJF



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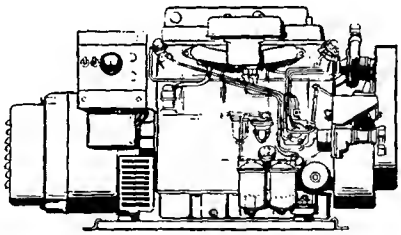

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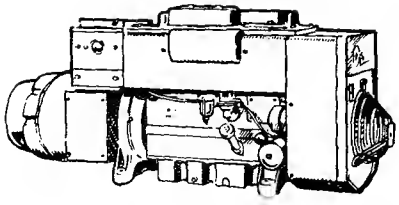

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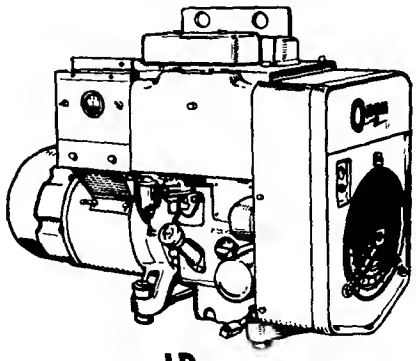


JB

INTRODUCTION

GENERAL

This manual contains troubleshooting and repair procedures for the YD generators and controls but not the engine; look for engine information in the applicable engine manual. Three systems which could cause the electric generating set to malfunction are: the generator (and its related systems), the control and the engine.

The *YD Generator* Part I contains description, adjustments and tests, and troubleshooting procedures for repairing the generator, exciter and voltage regulator.

The *Control* system Part II includes description and troubleshooting procedures for repairing the set if the trouble is in starting, stopping, or if the set shuts down because of an emergency condition.

Typical wiring diagrams are included at the end of this manual to help personnel trace or isolate problems. Onan suggests, however, that the serviceman use the wiring diagrams shipped with the units.

Repair information is not extensive because the plug-in solid-state printed circuit boards lend themselves more to replacement than repair. ONAN does not recommend repair of the printed circuit boards, except at the factory and has initiated a return/exchange service obtainable through distributors, whereby faulty printed circuit boards can be returned and exchanged for good units. For more information, contact your Onan distributor.

Application of meters or high heat soldering irons to printed circuit boards by other than qualified personnel can result in unnecessary and expensive damage.

TEST EQUIPMENT

Most of the test procedures in this manual can be performed with an AC-DC multimeter such as a Simpson Model 260 VOM. Some other instruments to have available are:

- Onan Multitester
- Wheatstone Bridge
- Kelvin Bridge
- Jumper Leads
- Onan Load Test Panel
- Variac
- AC Voltmeter
- DC Voltmeter

See Tool Catalog 900-0019.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

MANUAL REFERENCE FOR J-SERIES SETS WITH YD GENERATOR

ENGINE	KW		PARTS CATALOG	OPERATOR'S MANUAL	STATOR STACK LENGTH
Gasoline	**60 Hz**	**50 Hz**			
JB	7.5	6.0	967-0320	967-0320	2.88
JC	12.5		967-0220	967-0120	4.31
MJC	10.0		968-0340	968-0340	3.44
RJC	12.5	10.0	974-0220	974-0120	4.31
JC	15.0	12.5	967-0220	967-0120	5.00
MJC	15.0		968-0340	968-0340	5.00
RJC	15.0	12.5	974-0220	974-0120	4.31
Diesel					
DJB	6.0	4.5	967-0221	967-0121	2.19
MDJE	7.5	6.0	968-0220	968-0120	2.88
DJC	12.0	9.0	967-0222	967-0122	4.31
MDJC	12.0	10.0	968-0341	968-0341	4.31
RDJC	15.0	12.5	974-0301	974-0301	5.00
MDJF	15.0	12.0	968-0221	968-0121	5.00
RDJF	17.5	14.5	974-0308	974-0308	5.75

PART I YD GENERATORS

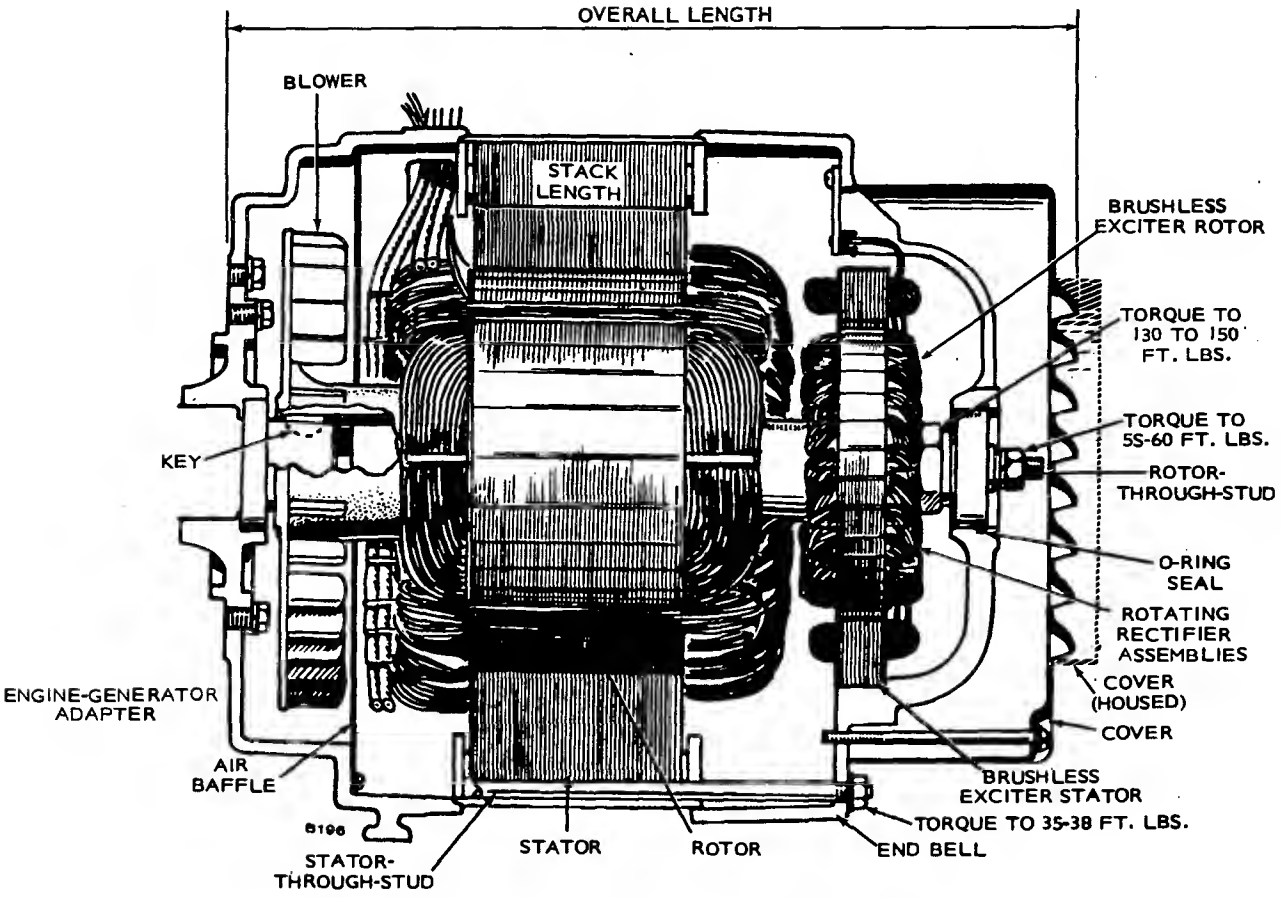


FIGURE 1. GENERATOR (SECTIONAL VIEW)

AC GENERATOR DESCRIPTION

The YD generators beginning with Spec AA (Figure 1) are four-pole, revolving field, brushless exciter, reconnectible models of drip-proof construction. Generator design includes both single and three-phase, 60 and 50 hertz type generators. The generator rotor connects directly to the engine crankshaft with a tapered shaft and key. The generator is fastened to the engine by the rotor-through-stud which passes through the rotor shaft; it has a nut on the outside of the end bell. A centrifugal blower, on the front end of the rotor shaft, circulates the generator cooling air which is drawn in through the end bell cover and discharged through an outlet at the blower end.

A ball bearing in the end bell supports the outer end of the rotor shaft. The end bell and generator stator housing are attached by four-through-studs which pass through the stator assembly to the engine-generator adapter. The brushless exciter stator mounts in the end bell while the exciter rotor and its rotating rectifier assemblies mount on the generator rotor shaft.

All generators have five wires extending from the stator housing in addition to the AC output leads, Figure 2. Lead B^2 is from the battery charge winding and connects to terminal 7 of the engine control. Lead F^{1+} and F^{2-} are from the exciter field winding and are

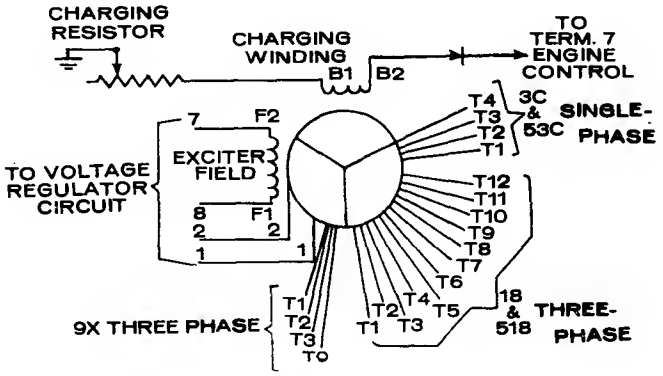


FIGURE 2. SINGLE AND THREE PHASE GENERATOR SCHEMATIC (COMPOSITE)

connected to the output terminals of the voltage regulator. Leads 1 and 2 are connected to the stator windings and provide reference voltage and input power to the voltage regulator. These five leads are connected at the factory.

Figure 2 is a composite illustration showing four output leads for single-phase units, 12 output leads for 3-phase broad range units, and four output leads for code 9X 3-phase 347/600 volt generators.

GENERATOR OPERATION

The basic operation of the generator and voltage regulator involves the stator, voltage regulator, exciter field and armature, a full wave bridge rectifier, and the generator rotor, Figure 3. Residual magnetism in the generator rotor and a permanent magnet embedded in one exciter field pole begin the voltage build-up process as the generator set starts running. Single-phase AC voltage, taken from one of the stator windings, is fed to the voltage regulator as a reference voltage for maintaining the generator output voltage. The AC reference voltage is converted to DC by a silicon controlled rectifier bridge on the voltage regulator printed circuit board and fed into the exciter field windings. The exciter armature produces three-phase AC voltage that is converted to DC by the rotating rectifier assembly. The resultant DC voltage excites the generator rotor winding to produce the stator output voltage for the AC load.

The generator rotor also produces AC voltage in the charging winding of the stator which is converted to direct current for battery charging.

VOLTAGE REGULATOR

The line-voltage regulator (VR22 or VR23) on the Spec AA J-Series generator sets is an all solid state device; that is, no relays or tubes are needed. Basic components of the voltage regulator are:

- Printed circuit board VR21
- Voltage reference transformer T21
- Commutating reactor CMR21
- Field circuit breaker CB21
- Voltage adjust rheostat R22 (Optional)

Figure 4 shows the above components and voltage regulator wiring diagrams for typical control boxes on electric generating sets. The electrical schematic and printed circuit board are shown in Figure 5.

The voltage adjust rheostat (R^{22}) is optional on either VR^{22} or VR^{23} voltage regulator assembly. When R^{22} is used, it is connected between VR^{21-1} and VR^{21-3} (Figure 5) and the jumper between VR^{21-1} and VR^{21-2} (Figure 4) is removed.

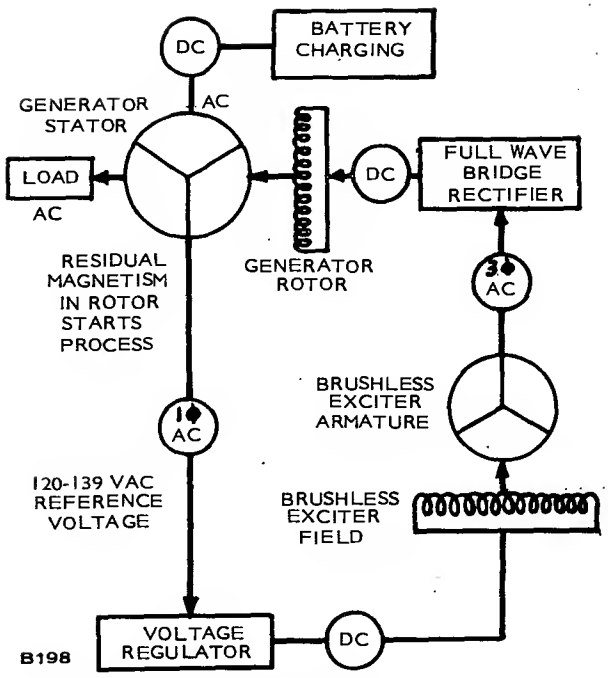


FIGURE 3. EXCITATION BLOCK DIAGRAM

INSTALLATION AND RECONNECTION CAPABILITIES

YD generators have the capability of being operated in a number of different voltage connections, and at different voltages in a single connection. The connections and voltages which can be obtained from a given generator are defined by the generator voltage code on the nameplate and listed in Figure 6.

CAUTION **To prevent generator damage, do not attempt to operate a generator with a given voltage code in any connection or at any voltage not listed for that voltage code.**

NOTE 1. When connecting the generator output leads for a new or different connection or when the operating voltage of a single voltage connection is to be changed, be sure that jumper wire W10 on VR^{21} is properly connected from terminal V^4 to V^1, V^2, or V^3 as listed in Figure 6 to provide the correct reference voltage.

NOTE 2. Connect the wire from transformer T^{21}-X^1 to terminal VR^{21-5} for code -53C and -518 (50 Hertz) generators. Connect T^{21}-X^1 to VR^{21-6} for code -3C, -18, and -9X (60 Hertz) generators. Connect the rest of the wires on the voltage regulator assembly according to the wiring diagram and wiring tabulation chart which applies to your generator set.

Generator sets without a control panel or switchboard containing AC instruments such as voltmeters, ammeters, running time meter, frequency meters, and line circuit breakers are shipped from the factory with the AC output leads separated in the output box. On generator sets with switchboards containing AC instruments, the AC output leads are wired as specified on the customer's purchase order to deliver only the voltage specified.

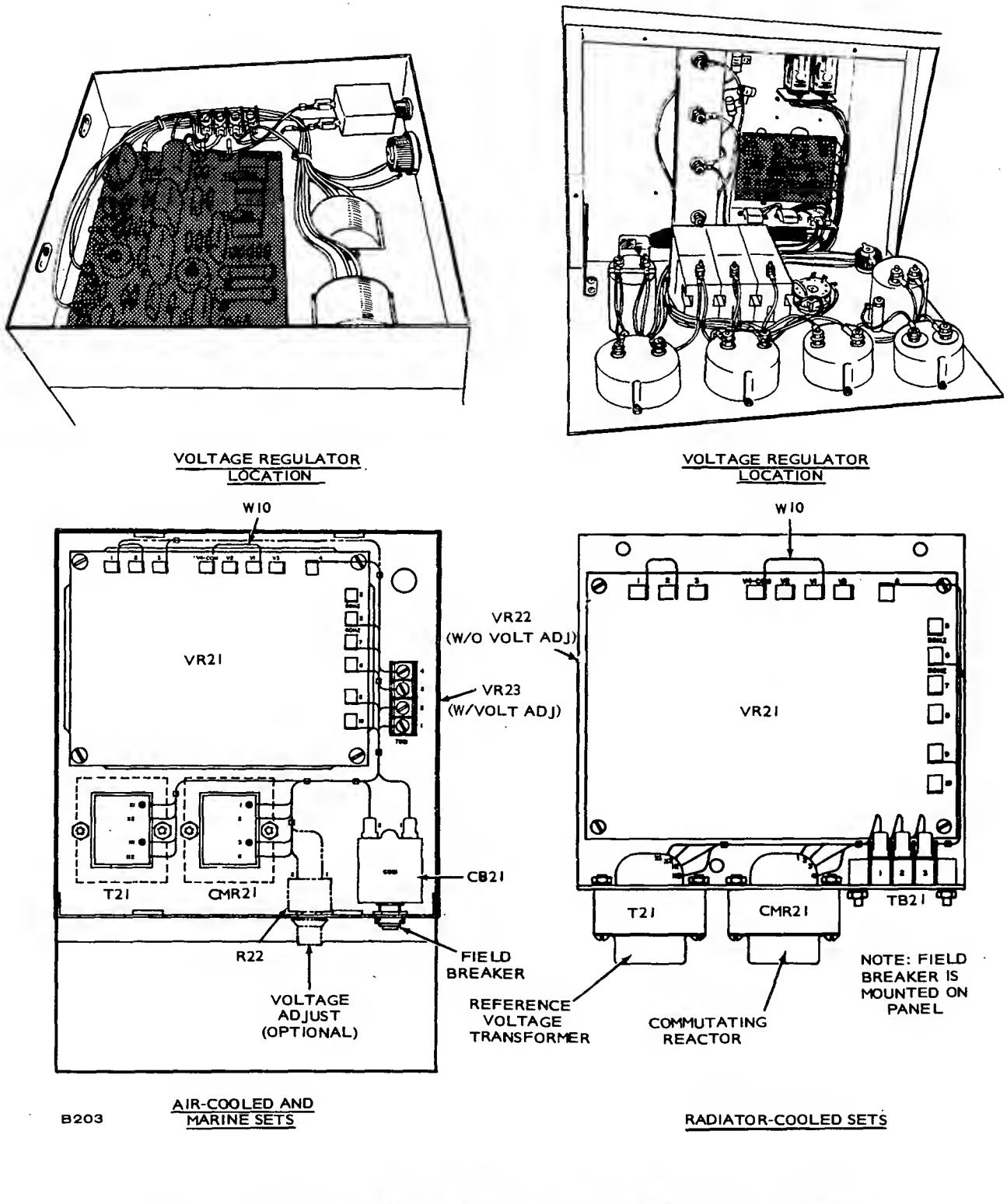
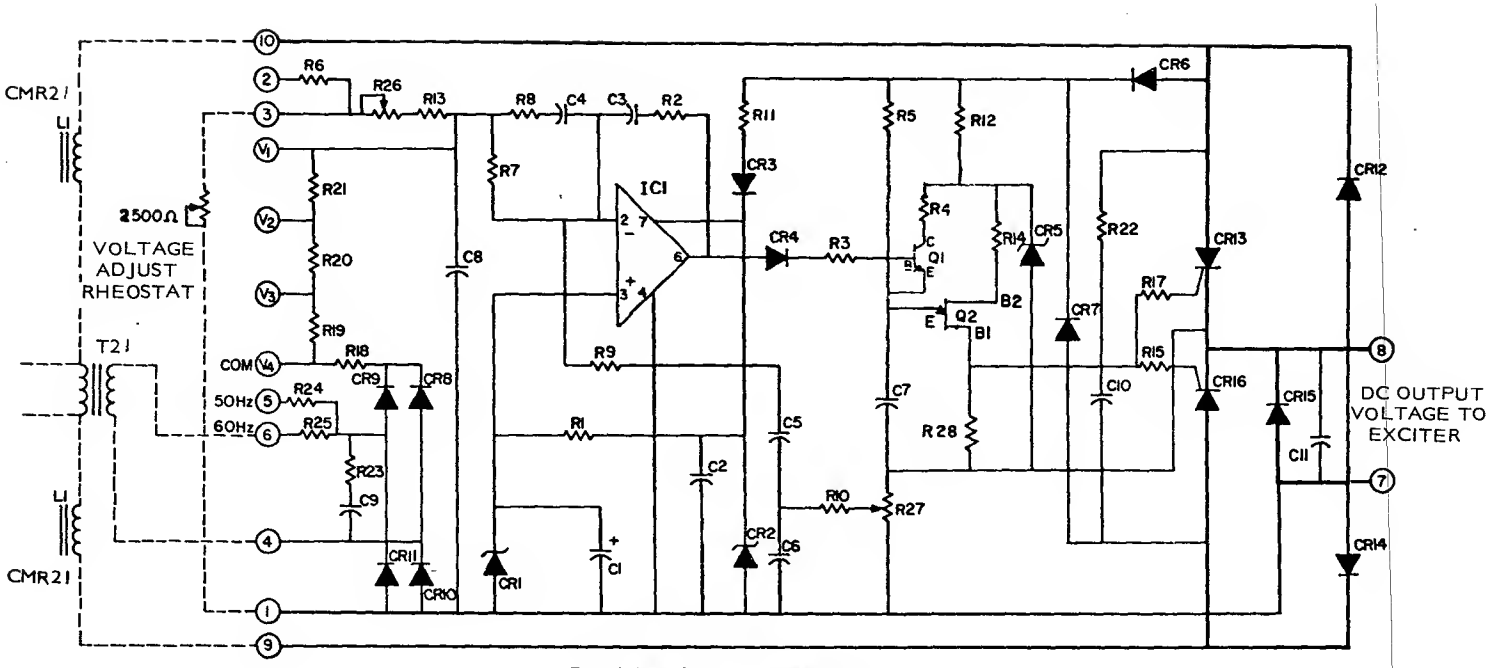
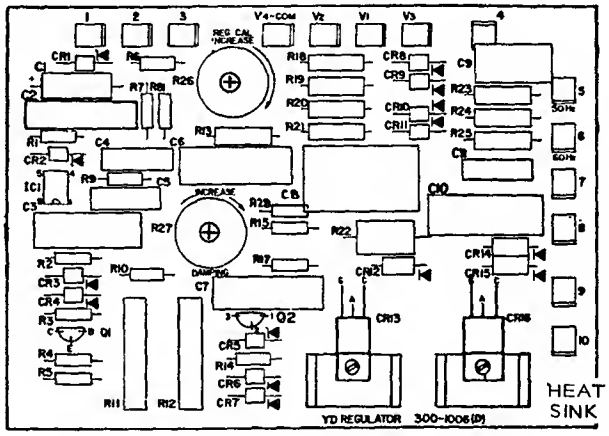


FIGURE 4. VOLTAGE REGULATOR ASSEMBLY LOCATIONS AND WIRING DIAGRAMS



REGULATOR SCHEMATIC

REF. DES.	DESCRIPTION
IC1	Integrated Circuit
Q1	Transistor-NPN
T21	Transformer, Reference Voltage
CMR21	Commutating Reactor
R27	Potentiometer W.W. 8K-Ohm
R26	Potentiometer W.W. 2.5K-Ohm
R25	Resistor-Film 42.2K-Ohm, 1/4W
R24	Resistor-Film 46.4K-Ohm, 1/4W
R23	Resistor 10-Ohm, 1/2W
R22	Resistor 820-Ohm, 2W
R21	Resistor-Film 2.67K, 1/4W
R20	Resistor-Film 1.53K, 1/4W
R19	Resistor-Film 3.09K, 1/4W
R18	Resistor-Film 28.0K, 1/4W
R16	Resistor 8.2K-Ohm, 1/2W
R15,17	Resistor 180K-Ohm, 1/2W
R14	Resistor 2700-Ohm, 1/2W
R13	Resistor-Film 12.1K-Ohm, 1/4W
R11,12	Resistor-Wire Wound 4K, 5W
R9	Resistor 1 MEG Ohm, 1/2W
R8-10	Resistor 100K-Ohm, 1/4W
R7	Resistor 270K-Ohm, 1/2W
R6	Resistor-Film 1.74K-Ohm, 1/4W
R5	Resistor 2 MEG Ohm, 1/2W
R4	Resistor 3K-Ohm, 1/2W
R3	Resistor 330K-Ohm, 1/2W
R2	Resistor 220K-Ohm, 1/2W
R1	Resistor 33K-Ohm, 1/2W
Q2	Transistor-Unijunction
CR13,16	Rectifier-Gate Control
CR12, 14, 15	Rectifier-Diode
CR5	Diode-Zener 18V
CR3,4,6-11	Rectifier-Diode 400MA 400V
CR2	Diode-Zener 20V
CR1	Diode-Zener 5.6V
C10	Capacitor .47MFD 400V
C9	Capacitor .39MFD 100V
C8	Capacitor 1MFD 100V
C4, C5	Capacitor .1MFD 200V
C3, C7	Capacitor .22MFD 200V
C2, C6	Capacitor .47MFD 100V
C1	Capacitor-Electrolytic 100MFD 10V



PRINTED CIRCUIT BOARD, VR21

NOTE: The 2500 ohm external voltage adjust potentiometer connects between pin 1 and pin 3. See regulator schematic. If your set does not have an external voltage adjust potentiometer, pin 1 is jumpered to pin 2. See Figure 4.

C11	Capacitor, 1MFD - 200V.
R28	Resistor, 47 OHM 1/2 W.

FIGURE 5. VOLTAGE REGULATOR PRINTED CIRCUIT BOARD

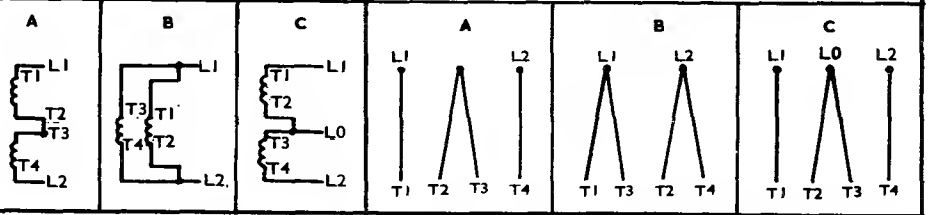
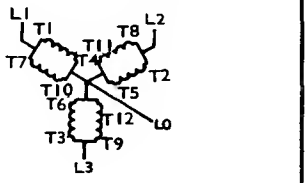
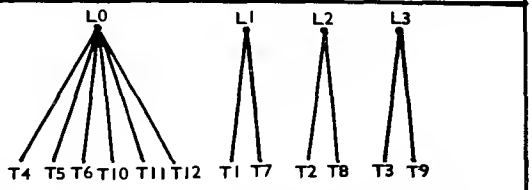
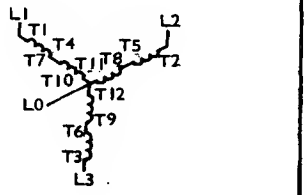
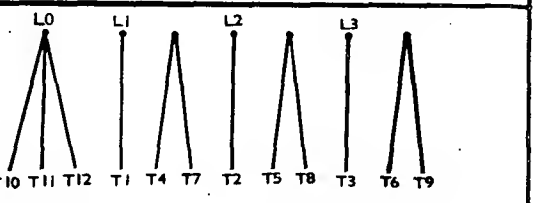
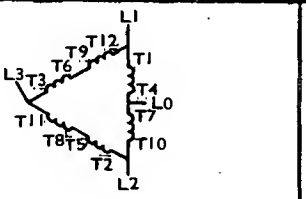
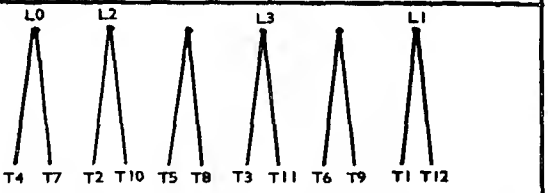
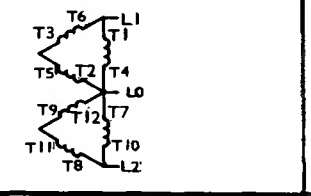
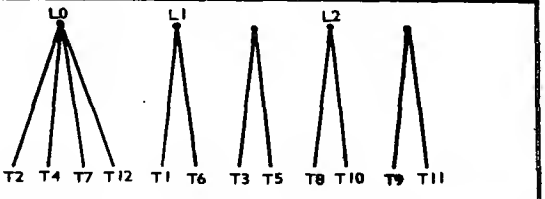
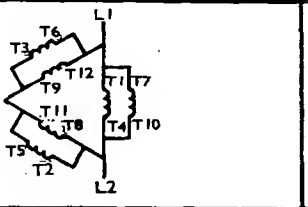
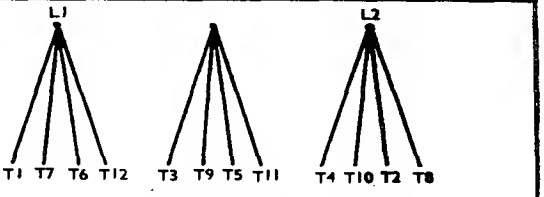
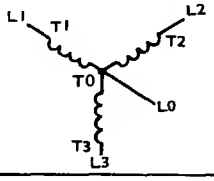
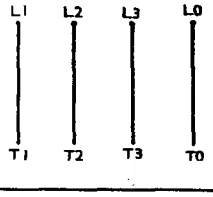
NAMEPLATE VOLTAGE CODE	VOLTAGE	PHASE	FREQUENCY	CONNECT W/O JUMPER WIRE FROM V4 TO:	GENERATOR CONNECTION	GENERATOR CONNECTION SCHEMATIC DIAGRAM	LOAD TO GENERATOR CONNECTION WIRING DIAGRAM
							CONNECT X1 TO VR21-5 FOR 50 HERTZ: CONNECT X1 TO VR21-6 FOR 60 HERTZ GENERATORS.
3C	120/240	1	60	V1			
53C	120/240	1	50	V3			
	115/230	1	50	V2			
	110/220	1	50	V1			
18	120/208	3	60	V1	PARALLEL WYE		
	127/220	3	60	V2			
	139/240	3	60	V4			
518	110/190	3	50	V1			
	115/200	3	50	V2			
	120/208	3	50	V3			
	127/220	3	50	V4			
18	240/416	3	60	V1	SERIES WYE		
	254/440	3	60	V2			
	277/480	3	60	V4			
518	220/380	3	50	V1			
	230/400	3	50	V2			
	240/416	3	50	V3			
	254/440	3	50	V4			
18	120/240	3	60	V1	SERIES DELTA		
518	110/220	3	50	V1			
	115/230	3	50	V2			
	120/240	3	50	V3			
18	120/240	1	60	V1	DOUBLE DELTA		
518	110/220	1	50	V1			
	115/230	1	50	V2			
	120/240	1	50	V3			
18	120	1	60	V1	PARALLEL DELTA		
518	110	1	50	V1			
	115	1	50	V2			
	120	1	50	V3			
9X	347/600	3	60	V4	WYE		
B20C							

FIGURE 6. GENERATOR WIRING AND RECONNECTION DIAGRAMS

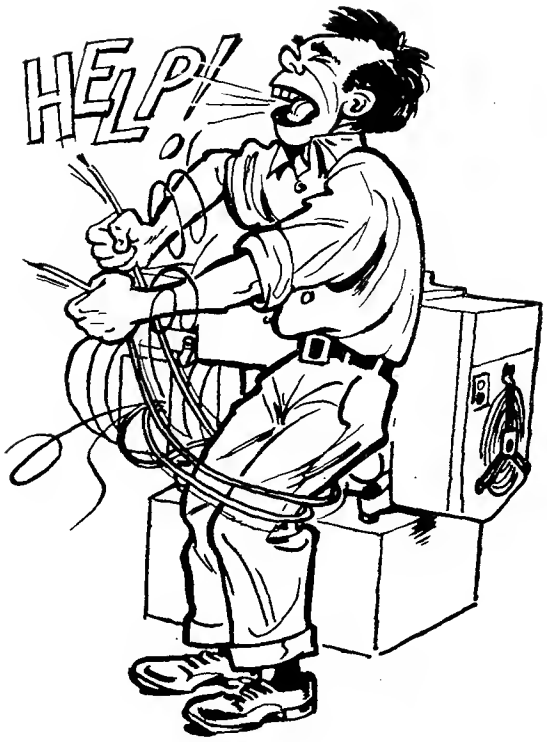
VOLTAGE RECONNECTION WITH OPTIONAL INSTRUMENTS

The optional AC instruments on the control panel (such as voltmeters, ammeters, transformers, and running time meters) are intended for use with specific nameplate voltages. Control components may have to be changed to match new current ratings when field reconnection for other voltage codes or voltages are made.

CAUTION **To prevent instrument damage contact the Onan factory for required instrument changes, new wiring diagrams, new plant nameplate with proper specification number and voltage before attempting to reconnect a generator with instruments on the control panel.**

Under no circumstances shall the generator be connected in any other manner than shown in Figure 6.

Severe damage will result if leads are incorrectly connected or improperly insulated. Use extreme care in checking leads to assure proper connections.



ADJUSTMENTS AND TESTS

GENERAL

The adjustment and test procedures herein are referenced in the generator troubleshooting tables, pages 18-20. The following information is needed by servicemen to effectively service or repair J-series generators beginning with Spec AA.

[A]

VOLTAGE CALIBRATION ADJUSTMENT

The calibration adjustment is made using an accurate AC voltmeter to observe generator output voltage and to set the correct no load voltage. If voltage regulator VR^{21} printed circuit board has been replaced, it may be necessary to make a calibration adjustment. To obtain the correct output voltage, proceed as follows:

1. If set has a voltage adjust potentiometer (R^{22}) on the meter panel, set pointer halfway between minimum and maximum positions.
2. With unit running at no load, turn generator voltage potentiometer R^{26} on VR^{21} (Figure 4) clockwise to increase output voltage; turn R^{26} counterclockwise to decrease output voltage.

[B]

VOLTAGE STABILITY ADJUSTMENT

Voltage stability is set at the factory, but if printed circuit board VR^{21} has been replaced or if damping potentiometer R^{27} has been unnecessarily adjusted it may be necessary to reset stability. Set stability as follows:

1. With generator set running at no load, turn potentiometer R^{27} (Figure 4) to a position where voltage tends to be unstable or hunt.
2. Turn R^{27} clockwise slowly until voltage first stabilizes. This setting will result in stable voltage under all conditions in maximum voltage regulator response time.

[C]

BATTERY CHARGE RATE ADJUSTMENT

One generator winding supplies current for the battery charging circuit. The current flows to diode CR^{11}, ammeter M^{11}, to the battery, and to the ignition-fuel solenoids circuits, Figure 2.

1. The slide tap on adjustable resistor R^{21}, located in the generator air outlet, should be set to give about 2 amperes charging rate, Figure 2. For applications requiring frequent starts, check battery charge condition (specific gravity) periodically and if necessary, increase charging rate slightly (slide tap nearer ungrounded lead) until it keeps battery charged. Having engine stopped when readjusting avoids accidental shorts. Avoid overcharging.
2. If charge winding AC output is below:
   a. 19 volts on 12 volt battery charge models,
   b. 38 volts on 24 volt battery charge models,
   c. 50 volts on 32 volt battery charge models,
   test the charging circuit for opens or grounds in the leads and charging winding. If leads are defective, replace them. If winding is defective, replace generator stator.
3. If a separate automatic demand control for starting and stopping is used, adjust charge rate for maximum 4.5 amperes. This normally keeps battery charged even if starts occur as often as 15 minutes apart.

[D]

VOLTAGE REGULATOR CHECKOUT

The solid state voltage regulators (VR^{21}) can be checked out on the bench for proper operation or location of faulty components. The following test equipment (one-each) is required for a proper checkout.

REF. DESIGNATION	TEST EQUIPMENT
S	Switch
CMR21	Reactor
F	Fuse, 5 Amps
T1	Transformer, Variable 2 Amp 0-150V
V2	Voltmeter, DC ±2% of Full Scale 3, Scale 0-50 and 0-150V and 0-10V
V1	Voltmeter, AC ±2% @ 10VAC, 1% @ 150V
R1	Resistor, 100-Ohm 400 W
T21	Transformer, Input 315-0386

Transformer T^{21} and reactor CMR^{21} are a part of the voltage regulator assembly (VR^{22} or VR^{23}); these are the only parts obtainable with an Onan part number. The big 100-ohm 400 watt resistor (R^{1}) serves as the field during checkout.

Bench Check:

1. Remove voltage regulator from unit according to procedure given for voltage regulator replacement.
2. Referring to Figure 7 and Table 1, connect test equipment to the printed circuit board VR^{21} terminals as follows:

CONNECT	FROM	TO
Jumper	VR21-V1	VR21-V4
Jumper	VR21-1	VR21-2
Lead	CMR21-1	VR21-10
Lead	CMR21-4	VR21-9
Lead	T21-X1	VR21-6
Lead	T21-X2	VR21-4
AC Voltmeter	Across	T21-H1 & H2
DC Voltmeter	Across	CR21-7 & 8
VARIAC	Across	T21-H1 (fused) and H2

3. Open switch in 120 VAC supply to VARIAC.
4. Plug VARIAC into 120 VAC source.
5. Proceed with checkout according to steps in Table 1.

[E]

FLASHING THE FIELD

The following procedure is used for momentarily flashing the exciter field with a low voltage which restores the residual magnetism in the alternator rotor. Flashing the field is usually necessary when installing a new brushless exciter stator wound assembly, but seldom is necessary under other circumstances. Always check generator residual voltage at terminals 1 and 2 to be certain whether or not flashing the field is necessary. Generator residual voltage should be at least 20 VAC at rated speed. If residual is too low and the output voltage will not build up, flash the field as follows:

1. Locate terminals 7(-) and 8(+) on voltage

TABLE 1. VOLTAGE REGULATOR CHECKOUT

V_1 AC INPUT VOLTAGE
V_2 DC OUTPUT VOLTAGE

(<= LESS THAN) (>= MORE THAN)

STEP NO.	TEST NAME	PROCEDURE	REQUIREMENTS
1	BUILD UP	SET V_1 TO 25 VAC	V_2 SHALL BE > 12 VDC
2	CALIBRATION	SET V_1 TO 120 VAC	SET POT R26 TO HOLD V_2 BETWEEN 50-70 VDC
3	RANGE	A. SET V_1 TO 123 VAC B. SET V_1 TO 125 VAC	V_2 SHALL BE < 30 VDC V_2 SHALL BE < 10 VDC
4	RANGE	A. SET V_1 TO 115 VAC B. SET V_1 TO 117 VAC	V_2 SHALL BE > 85 VDC V_2 SHALL BE > 80 VDC
5	MAX VOLTAGE	SET V_1 TO 150 V	V_2 < 10 VOLTS
6	DAMPING	SET V_1 SO V_2 IS NEAR MAXIMUM RAPIDLY TURN POT R27 FROM FULL COUNTER CLOCKWISE POSITION TO FULL CLOCKWISE POSITION. RETURN R27 TO MIDRANGE POSITION AFTER TEST.	V_2 SHOULD DROP TO < 50 VOLTS THEN RISE TO ORIGINAL VALUE.

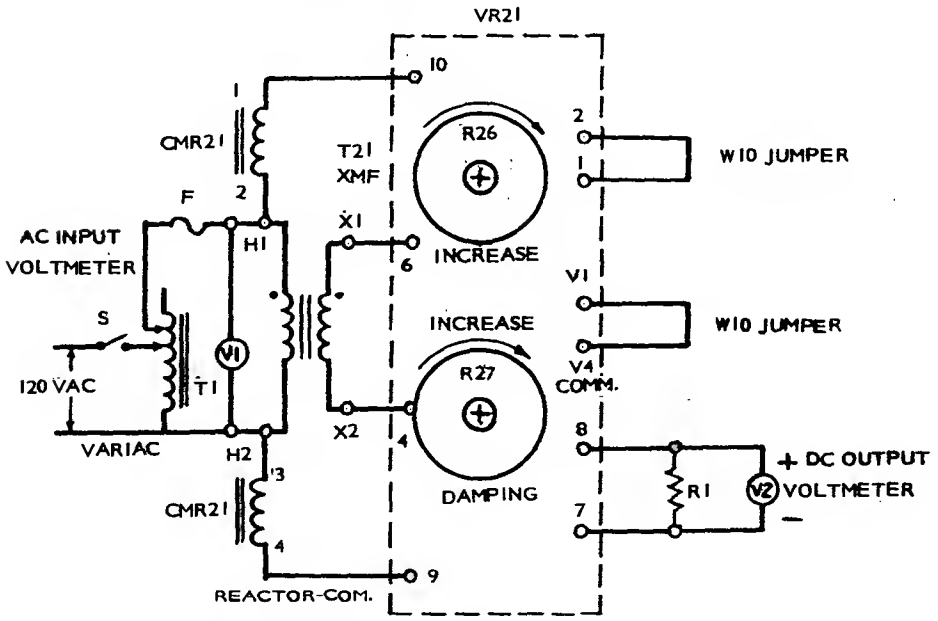


FIGURE 7. VOLTAGE REGULATOR CHECKOUT TEST EQUIPMENT CONNECTIONS

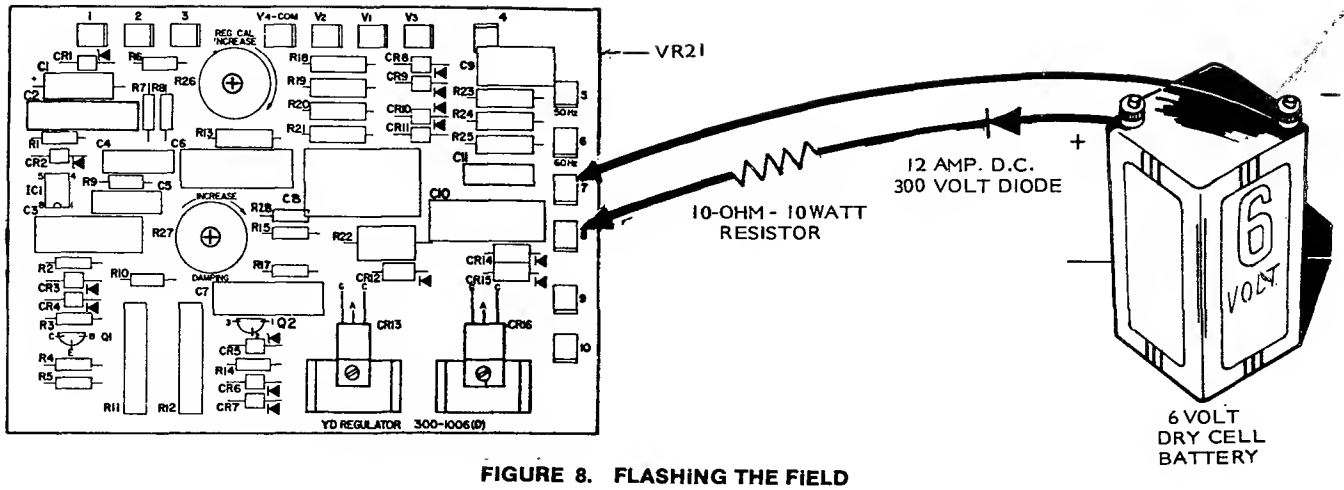


FIGURE 8. FLASHING THE FIELD

regulator printed circuit board (VR^{21}).

2. Use a six volt dry cell battery with two clip leads, a 12 amp DC, 300 volt avalanche diode, and a 10-ohm resistor as shown in Figure 8. If a six volt battery is not available, a 12 volt automotive battery can be used by increasing the 10-ohm resistance to 20-ohms; or a 24 volt automotive battery can be used by increasing the resistance to 40-ohms.

CAUTION **A series resistor MUST be used to protect the meter. Polarity must be observed.**

3. After starting engine, touch positive (+) battery lead to VR^{21-8} and negative (-) lead to VR^{21-7}, contact terminals just long enough until voltage starts to build up or damage may occur to exciter-regulator system.

WARNING **Be cautious when working on a generator that is running to avoid electrical shocks.**

TEST PROCEDURES

All of the following tests can be performed without disassembly of the generator as shown in the illustrations herein. Use the following test procedures for testing generator components in conjunction with the troubleshooting tables.

[F]

TESTING ROTATING RECTIFIERS

Two different rectifier assemblies make up the rotating rectifier bridge assembly, Figure 9. Using an accurate ohmmeter, test each CR using negative and positive polarities. Test rectifiers as follows:

1. Disconnect all leads from assembly to be tested.
2. Connect one test lead to $F^{1}+$ stud and connect other lead to CR^{1}, CR^{2}, and CR^{3} in turn; record resistance value of each rectifier.
3. Connect one lead to $F^{2}-$ stud and connect other lead to CR^{3}, CR^{4} and CR^{5} in turn; record resistance value of each rectifier.
4. Reverse ohmmeter leads from step 2 and record resistance value of each rectifier $F^{1}+$ to CR^{1}, CR^{2}, and CR^{3} and $F^{2}-$ to CR^{4}, CR^{5}, and CR^{6}.
5. All three resistance readings should be high in one test and low in the other test. If any reading is high or low in both tests, rectifier assembly is defective.
6. Replace defective rectifier assembly with new, identical part.

Use 24 ibs-in. torque when replacing nuts on $F^{1}+$ and $F^{2}-$, CR^{1}, CR^{2}, CR^{3}, CR^{4}, CR^{5}, and CR^{6}.

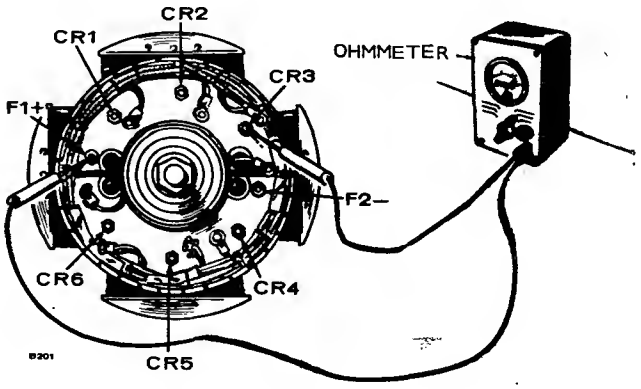


FIGURE 9. TESTING ROTATING RECTIFIERS

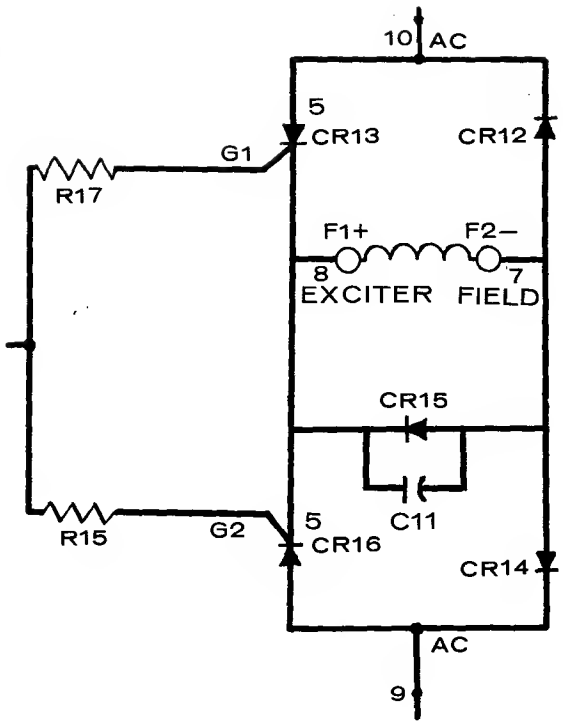


FIGURE 10. SILICON CONTROLLED RECTIFIER BRIDGE

[G]

TESTING OUTPUT BRIDGE DIODES

The output bridge rectifier diodes (Figure 10), CR^{12}, CR^{14}, and CR^{15}, are located on the voltage regulator printed circuit board. Using an accurate ohmmeter, test diodes CR^{12}, CR^{14}, and CR^{15} as follows:

1. Disconnect at least one lead of diode.
2. Connect one lead to each end of diode and observe resistance reading, Figure 11.
3. Reverse ohmmeter leads and again observe resistance readings.

A good diode has a higher reading in one direction than the other. If both readings are high, or low, diode is defective.

4. Replace defective diodes with new, identical parts.

[H]

TESTING SCR'S

Two identical silicon controlled rectifiers (SCR'S), CR^{13} and CR^{16}, control the DC output voltage to the exciter field. These SCR'S are mounted in heat sinks on the voltage regulator and are tested as follows:

1. Unsolder leads from CR^{13} and CR^{16}.
2. Using high scale on ohmmeter, connect ohmmeter leads to anode and cathode of the SCR as shown in Figure 12. The resistance reading should be one megohm or greater. Reverse ohmmeter leads to anode and cathode; resistance should again be one megohm or greater.

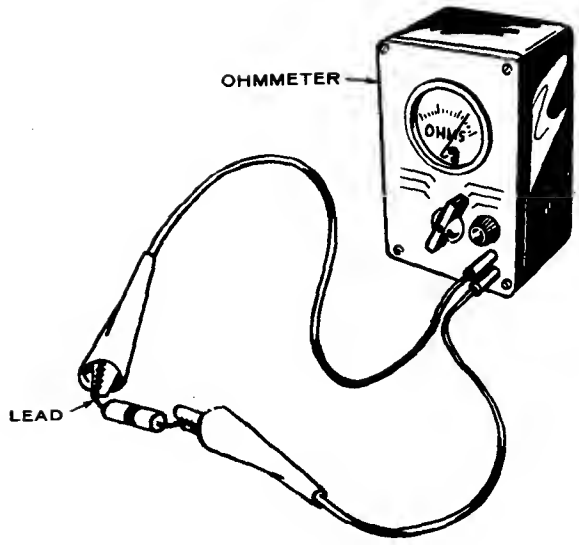


FIGURE 11. TESTING DIODES

3. Using a 6-volt dry cell battery and a 200-ohm series resistor, observe correct polarity and connect battery leads to anode and cathode as shown in Figure 13. Observe polarity and connect a DC voltmeter across the 200 ohm resistor. The voltmeter should now read zero. Jumper anode to gate; voltmeter should now read 6-volts. Remove jumper; voltmeter should still read 6-volts because the SCR remains turned on until voltage is removed from anode to cathode.

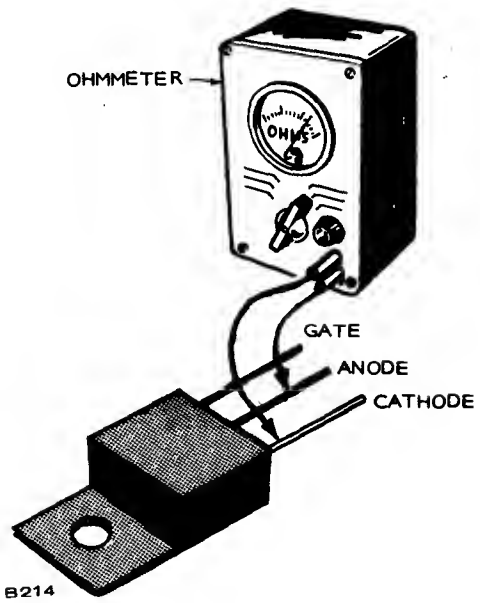


FIGURE 12. SCR RESISTANCE TEST

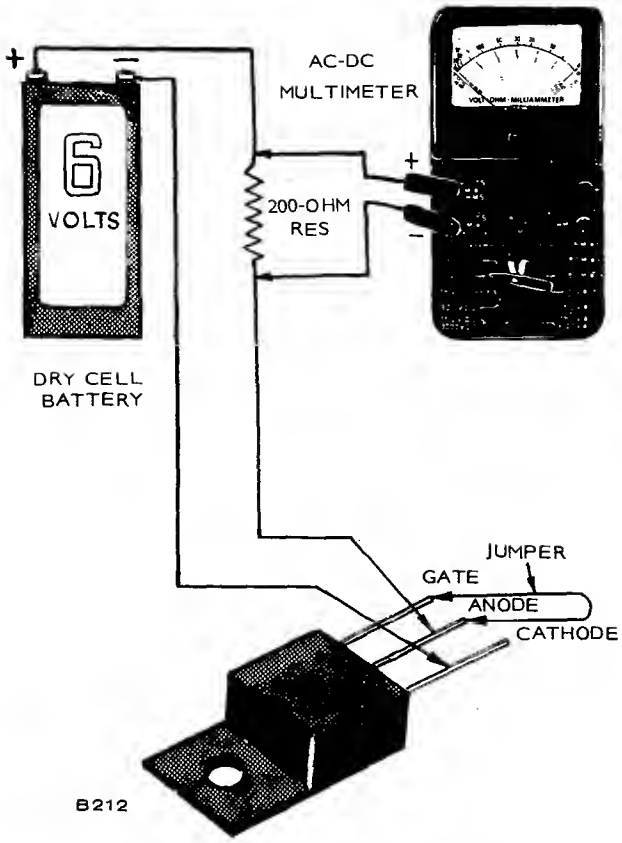


FIGURE 13. SCR VOLTAGE TEST

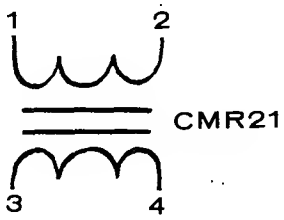
because the SCR remains turned on until voltage is removed from anode to cathode.

4. If the SCR does not pass either test, it is defective. Replace defective SCR with a new, identical part.

[I]

TESTING REACTOR

The reactor assembly CMR[21] leads are marked 1, 2, 3 and 4. Wires 1-2 and 3-4 are wound on the same iron core.

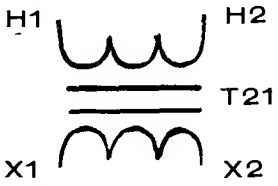


1. Resistance between 1-2 and 3-4 should be about 0.4-ohms.
2. Resistance between 1-3, 2-3, 1-4, or 2-4 should be infinity (∞).
3. Resistance from any terminal to reactor frame should be infinity.
4. If any of the above conditions are not met, install a new reactor.

[J]

TESTING REFERENCE TRANSFORMER

The transformer T[21] has four leads marked H^1, H^2, X^1, and X^2. H^1-H^2 are the primary leads. X^1-X^2 are the secondary leads.



1. Resistance between H^1-H^2 should be 122 to 150-ohms.
2. Resistance between X^1-X^2 should be 157 to 192-ohms.
3. Resistance between H^1-X^1, H^1-X^2, H^2-X^1 and H^2-X^2 should be infinity.
4. Resistance from any terminal to transformer frame should be infinity.
5. If any of the above conditions are not met, install a new reference transformer.

[K]

TESTING BRUSHLESS EXCITER STATOR

Like the generator, the brushless exciter stator (Figure 14) can be tested for open or shorted windings and grounds.

Testing for Open or Shorted Windings:

Disconnect F^{1}+ and F^{2}– exciter field leads from terminal block in generator end bell. The resistance between field leads should be 12.2 ±10% at 20 C (68 F.).

Testing for Grounds:

Connect ohmmeter between either field lead and exciter stator laminations. Use ohmmeter set at RX 100 scale. An ohmmeter reading of less than infinity (∞) indicates defective ground insulation.

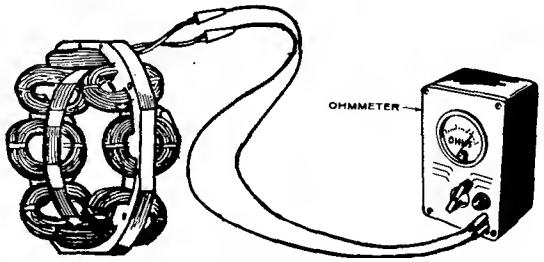


FIGURE 14. TESTING EXCITER FIELD

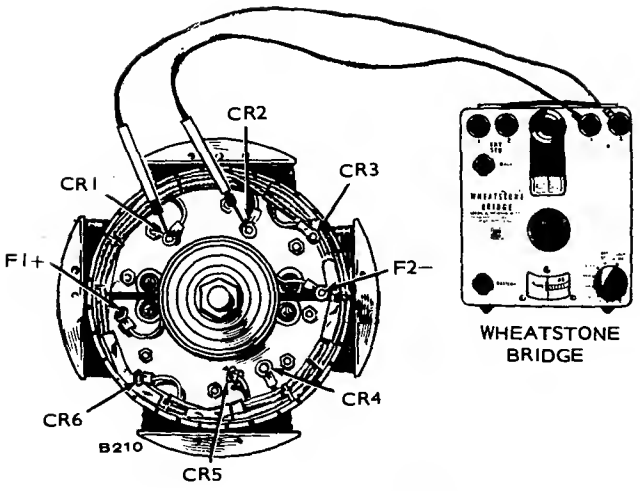


FIGURE 15. TESTING EXCITER ARMATURE

[L]

TESTING BRUSHLESS EXCITER ROTOR (ARMATURE)

The brushless exciter rotor (Figure 15), can be tested for open or shorted windings or grounds.

Testing for Open or Shorted Windings:

Use a Wheatstone Bridge for this test. Disconnect main rotor field leads which connect to rotating rectifier assemblies at $F^{1}+$ and $F^{2}-$. Disconnect lead wires from diodes CR^{1}, CR^{2}, CR^{3}, CR^{4}, CR^{5} and CR^{6}. Test between exciter lead pairs T^{1}-T^{2}, T^{2}-T^{3} and T^{1}-T^{3}. Resistance should be 0.5 to 0.6 ohms at 20 C (68 F.).

Testing for Grounds:

Connect leads of ohmmeter between each CR lead and exciter rotor laminations; use RX 100 scale on ohmmeter. An ohmmeter reading less than infinity (∞) indicates defective ground insulation.

[M]

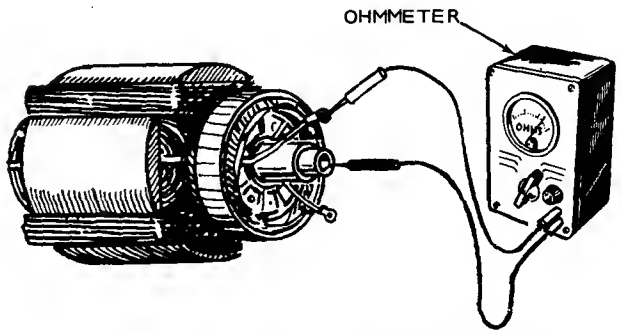
TESTING GENERATOR ROTOR

For these tests, use an ohmmeter on RX 100 scale.

Testing for Grounds:

On brushless type generators, check for grounds between each rotor lead and the rotor shaft, Figure 16 . Perform tests as follows:

1. Remove rotor leads $F^{1}+$ and $F^{2}-$ from rotating rectifier assemblies.
2. Connect ohmmeter leads between $F^{1}+$ and rotor shaft and between $F^{2}-$ and rotor shaft. Meter should not register.
3. If meter registers, rotor is grounded.
4. Replace grounded rotor with new, identical part.



CONTACT ONE PROD TO EACH OF THE FIELD LEADS AND OTHER PROD TO ROTOR SHAFT. IF ROTOR IS GOOD, THERE WILL BE NO READING ON OHMMETER.
B215

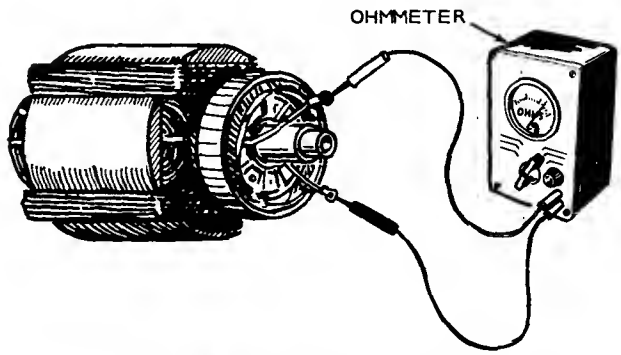
FIGURE 16. TESTING ROTOR FOR GROUNDS

Testing for Open or Shorted Winding:

All resistance values should be within ± 10% of values specified in Table 2 at 20° C. (68° F). Perform tests as follows:

1. Remove rotor leads $F^{1}+$ and $F^{2}-$ from rotating rectifier assemblies.
2. Using ohmmeter, check resistance between F^{1} and F^{2} leads, Figure 17. See Table 2 for proper resistance values.

   If resistance is low, there are shorted turns. If resistance is high, rotor winding is open. In either case, rotor must be replaced.
3. Replace defective rotor with new, identical part.



CONTACT ONE PROD TO ONE FIELD LEAD AND OTHER PROD TO OTHER FIELD LEAD. RESISTANCE VALUES ARE GIVEN IN TABLE 2.
B213

FIGURE 17. TESTING ROTOR FOR AN OPEN CIRCUIT

TABLE 2. RESISTANCE VALUES FOR ROTORS

KW RATING AND MODEL		RESISTANCE
50 HERTZ	60 HERTZ	OHMS @ 20° C (68°F)
4.5 DJB	6.0 DJB	2.45
6.0 JB	7.5 JB	2.76
6.0 MDJE	7.5 MDJE	2.76
—	10.0 MJC	2.05
—	12.5 JC	2.30
—	12.5 RJC	2.30
9.0 DJC	12.0 DJC	2.30
10.0 MDJC	12.0 MDJC	2.30
12.5 JC	15.0 JC	2.50
—	15.0 MJC	2.50
12.5 RJC	15.0 RJC	2.50
12.5 RDJC	15.0 RDJC	2.50
12.0 MDJF	15.0 MDJF	2.50
14.5 RDJF	17.5 RDJF	2.70

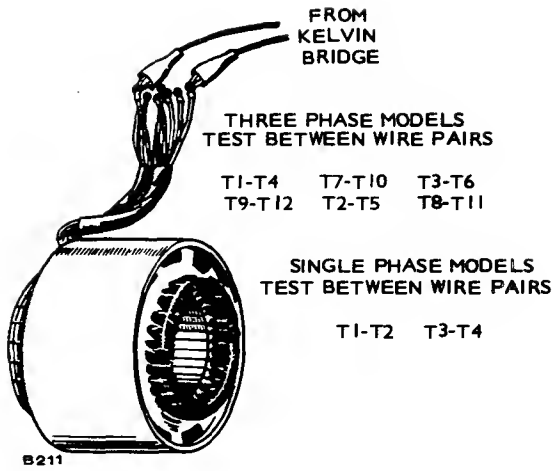


FIGURE 18. TESTING STATOR WINDINGS

[N]

TESTING GENERATOR STATOR

Using proper test equipment, check the stator for grounds, opens, and shorts in the windings.

Testing for Grounds:

Some generators have ground connections to the frame. Check wiring diagram.

Using an ohmmeter set at RX 100, test each stator winding for shorts to laminations. A reading less than one megohm indicates a ground.

Testing for Open or Shorted Windings:

Test for continuity between coil leads shown in Figure 18; all pairs should have equal resistance. Use an accurate instrument for this test such as a Kelvin Bridge. The proper resistance values are given in Table 3 according to KW ratings and voltage codes. All resistances should be ± 10% of value shown at 20° C. (68° F).

If any windings are shorted, open or grounded, replace the stator assembly. Before replacing the assembly, check the leads for broken wires or insulation.

[O]

WIRING HARNESS CHECK

Carefully check wiring harnesses as follows:

1. Inspect all wires for breaks, loose connections, and reversed connections. Refer to applicable wiring diagram.

TABLE 3. RESISTANCE VALUES FOR STATORS

KW RATING AND MODEL		VOLTAGE CODE				
50 Hertz	60 Hertz	18	518	3C	53C	9X
4.5 DJB	6.0 DJB	.695	.761	.360	.485	
6.0 JB	7.5 JB	.460	.498	.224	.294	
6.0 MDJF	7.5 MDJF	.460	.498	.224	.294	
	10.0 MJC	.340	—	.172	—	
	12.5 JC	.303	—	.120	—	
	12.5 RJC	.303	—	.120	—	Not
9.0 DJC	12.0 DJC	.303	.260	.120	.153	Available
10.0 MDJC	12.0 MDJC	.303	.260	.120	.153	
12.5 JC	15.0 JC	.220	.198	.087	.110	
	15.0 MJC	.220	—	.087	—	
12.5 RJC	15.0 RJC	.220	.198	.087	.110	
12.0 RDJC	15.0 RDJC	.220	.198	.087	.110	
12.0 MDJF	15.0 MDJF	.220	.198	.087	.110	
14.5 RDJF	12.5 RDJF	.162	.143	.066	.089	

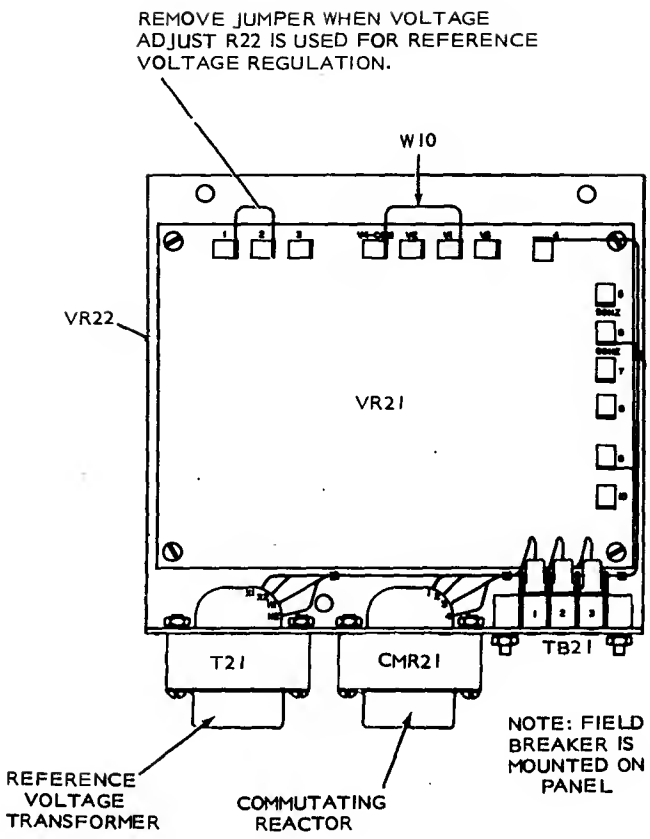
2. Remove wires from terminals at each end and using an ohmmeter, check each wire end to end for continuity or opens.
3. Using an ohmmeter, check each wire against each of the other wires for possible shorts or insulation breaks under areas covered by wrapping material.
4. Reconnect or replace wires according to applicable wiring diagram.

[P]

VR21 REPLACEMENT

Use the following procedure for replacing the voltage regulator PC board.

1. Stop engine.
2. Disconnect and if necessary, label the following wires: 3, 4, 5 or 6, 7, 8, 9, and 10.
3. Remove four screws at corners.
4. Remove used PC board.
5. Install new PC board; secure with four screws.
6. Reconnect wires removed in step 2 at the proper terminals.
7. Place jumper W10 at proper terminals for your particular voltage code and voltage connection. See Figure 6.
8. Perform voltage calibration and stability adjustment procedures to obtain the correct generator output voltage and stability with new PC board in set.



GENERATOR DISASSEMBLY

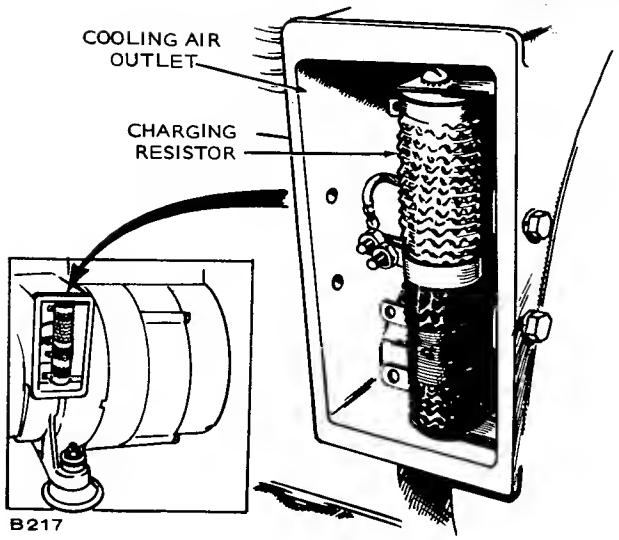


FIGURE 19. GENERATOR AIR OUTLET

GENERATOR DISASSEMBLY

1. Disconnect battery to prevent accidental starting of engine.
2. Remove end bell cover to reveal rotor-through-stud nut.
3. Remove B[1] lead from tapped adjustable resistor in generator air outlet opening, Figure 19.
4. Remove leads from control box to ignition system, choke, start disconnect switch, etc. on engine.
5. Remove stator-through-stud nuts, end bell, and stator assembly, Figure 20. Screwdriver slots in adapter provide a means for prying stator loose. Be careful not to let stator touch or drag on rotor.
6. Remove baffle ring from adapter. Turn rotor-through-stud nut to end of stud. While pulling rotor outward with one hand, strike nut a sharp blow. Support rotor with hoist and sling to avoid bending rotor-through-stud, Figure 21. Use a heavy, soft faced hammer to loosen the rotor from its tapered shaft fit. If rotor does not come loose, strike it a sharp downward blow in center of lamination stack. Rotate rotor and repeat until it comes loose. Be careful not to hit bearing or windings.
7. After disassembly, all parts should be wiped clean and visually inspected.

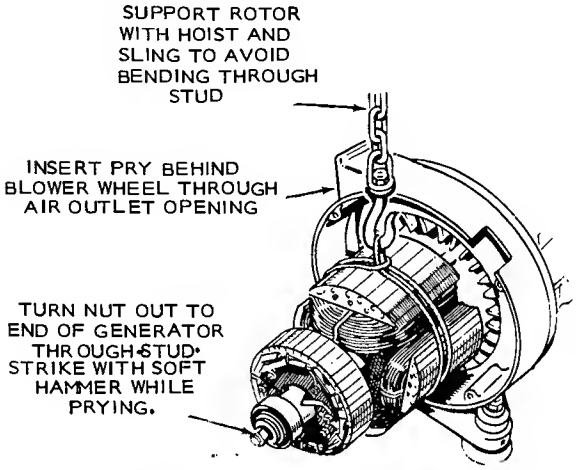


FIGURE 21. ROTOR REMOVAL

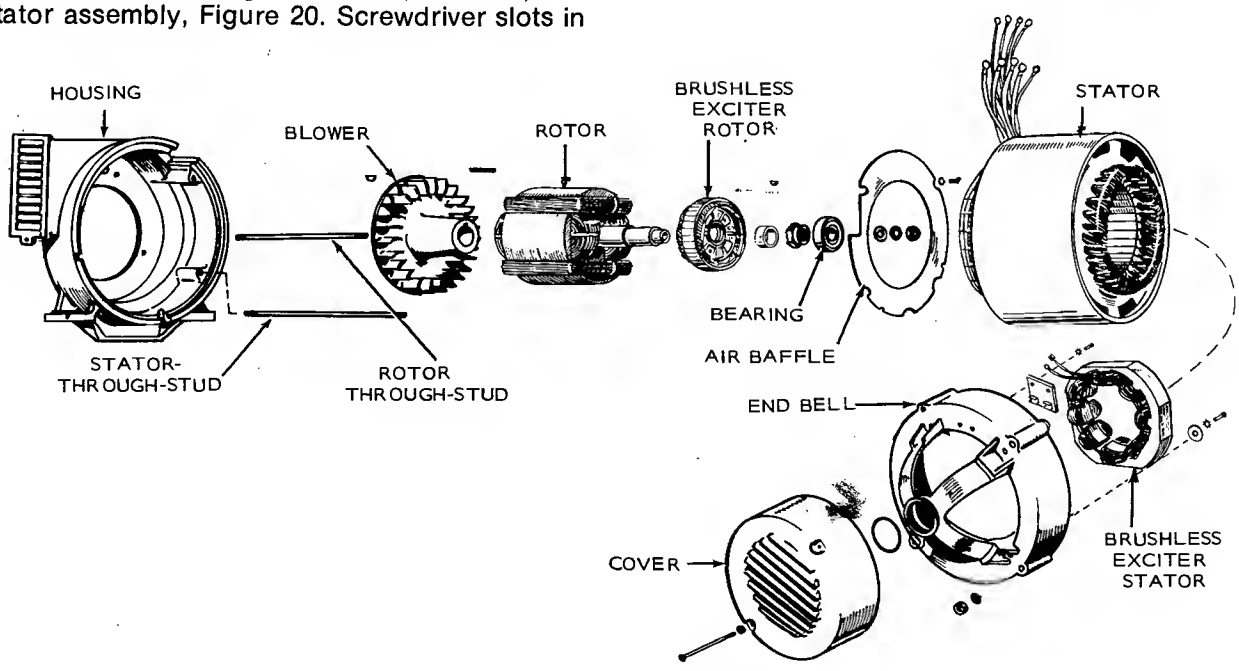


FIGURE 20. GENERATOR DISASSEMBLY

GENERATOR ASSEMBLY

1. Clean and inspect all mating surfaces.
2. Coat mating area between generator bearing and end bell bearing hole with a thin film of Molykote or equal.
3. Install rotor-through-stud in engine crankshaft.
4. Install key in the crankshaft.
5. Slide rotor over through-stud and onto crankshaft. Be careful not to let weight of rotor rest on or bend the through-stud.
6. Install baffle ring.
7. Install stator through-studs in adapter.
8. Install stator and end bell. Torque nuts on through-studs to 35 to 38 ft-lbs.

Make certain the B^1 lead is placed through the grommet in the baffle ring and out the air discharge opening in the adapter.

9. Torque down rotor-through-stud nut (55-60 ft. lb.). The rotor and stator are automatically aligned because stator and bearing support were tightened in step 8.
10. Tap end bell to align at horizontal and vertical plane; use a lead hammer to relieve stresses on components (recheck torque).
11. Reconnect leads to preheater, centrifugal switch and governor solenoid.
12. Install lead B^1 on adjustable resistor, R^{21}.

CAUTION **Check B^1 lead to see that it is short and is kept away from the blower. If necessary when installing a new stator or leads, cut B^1 lead shorter and reinstall the connector.**

13. Install end cover.

GENERATOR TROUBLESHOOTING

PREPARATION

A few simple checks and a proper troubleshooting procedure can locate the probable source of trouble and cut down troubleshooting time.

1. Check all modifications, repairs, replacements performed since last satisfactory operation of set to be sure that connection of generator leads are correct. A loose wire connection, overlooked when installing a replacement part could cause problems. An incorrect connection, an opened circuit breaker, or a loose plug-in printed circuit board are all potential malfunction areas to be eliminated by a visual check.
2. Unless absolutely sure that panel instruments are accurate, use portable test meters for troubleshooting.
3. Visually inspect components on VR21. Look for dirt, dust, or moisture and cracks in the printed solder conductors. Burned resistors, arcing tracks are all identifiable. Do not mark on printed circuit boards with a pencil. Graphite lines are conductive and can cause short circuits between components.

The question and answer troubleshooting guide which follows, gives a step-by-step procedure for checking the generator components. Refer to Figure 22 for an electrical schematic of the generator and voltage regulator connections.

TROUBLESHOOTING PROCEDURES

This troubleshooting information is divided into tables, A, B, C, and D as follows:

A. No build up of AC output voltage.
B. AC output voltage builds up, but is unstable.
C. AC output voltage builds up, but is high or low.
D. AC output voltage builds up, but field breaker trips.

To correct a problem, answer the question of the step either YES or NO. Then refer to the step number in the answer column and proceed to that step next.

Letters A through P in the Test Procedure column refer to detailed procedures in the Adjustments and Tests section, pages 8-15.

TABLE A. No Build Up of AC Output Voltage	Yes	No	Test Proc.
1. Is Field Breaker CB21 on control panel ON?	2	3	
2. Connect jumper wire across terminals of Field Breaker, CB21. Does AC output voltage build up? If voltage builds up REPLACE FIELD BREAKER.	—	4	
3. Push to reset Field Breaker. Does AC output voltage build up? If voltage builds up but is high, low, unstable, or causes tripping of Field Breaker, refer to Tables B, C, or D.	—	4	
4. Disconnect alternator stator leads 1 & 2 from TB21-1 and TB21-2 on VR22. Is reference voltage across 1 & 2 20 VAC or more?	14	13	

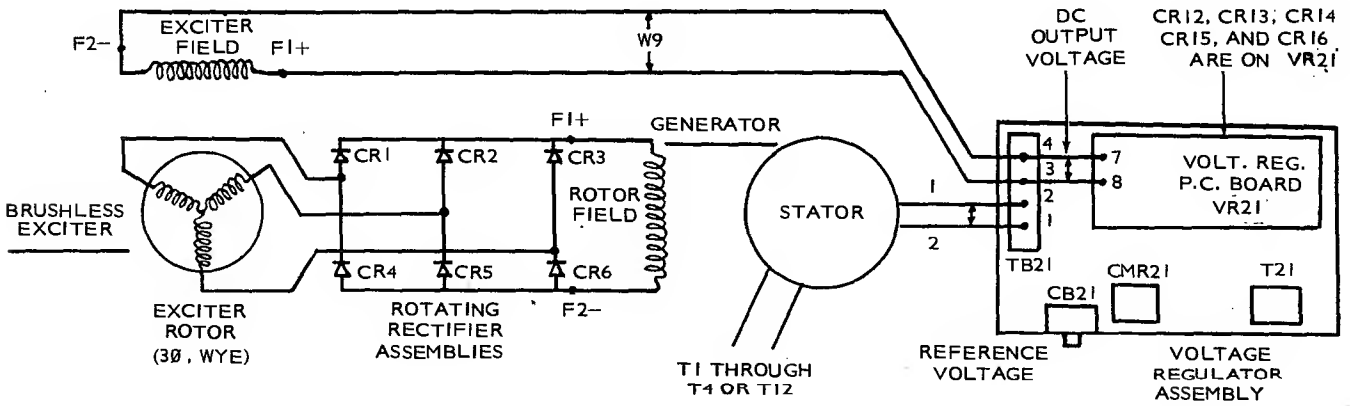


FIGURE 22. GENERATOR-REGULATOR ELECTRICAL SCHEMATIC

TABLE A. (continued)	Yes	No	Test Proc.
5. Is exciter field voltage across F1+ and F2– on endbell terminal block 7.0 VDC or more? If not, check wiring harness W9 from end bell to VR22 terminals 3 and 4.	6	—	
6. Is brushless exciter stator (field) winding OK?	7	—	K
7. Are diodes CR1, CR2, CR3, CR4, CR5, CR6 in rotating rectifier assemblies OK? Check all diodes - more than one may be defective.	8	—	F
8. Are brushless exciter rotor windings OK?	9	—	L
9. Is generator rotor field winding OK?	10	—	M
10. Are generator stator windings OK?	11	—	N
11. Is commutating reactor CMR21 OK?	12	—	I
12. Is reference transformer T21 OK?	18	—	J
13. Flash exciter field. Is reference voltage across 1 and 2 now 20 VAC or more?	14	5	E
14. Reconnect generator leads 1 & 2 to TB21-1 and TB21-2 on VR22. Does reference voltage build up?	—	15	
15. Is regulator DC output voltage across VR21-7 and VR21-8 7 VDC or more? See Figure 22.	5	16	
16. Are SCR's CR13 and CR16 OK?	17	—	H
17. Are diodes CR12, CR14, and CR15 OK?	18	—	G
18. Replace voltage regulator PC board (VR21)	—	—	P

TABLE B. AC Output Voltage Builds Up, But Is Unstable	Yes	No	Test Proc.
1. Are there any loose or broken wires or connections on voltage regulator assembly VR22?	—	2	
2. Is W9 (exciter field) wiring harness from VR22 to End bell OK?	3	—	
3. Does adjustment of Damping Control R27 potentiometer on VR21 result in stable voltage?	—	4	A
4. Replace PC Board VR21.	—	—	P

CAUTION **Do not replace the printed circuit board until the trouble not on the PC board has been located and corrected to avoid damage to new PC board.**

TABLE C. AC Output Voltage Builds Up, But is High or Low	Yes	No	Test Proc.
1. Is set running at correct RPM? (See appropriate engine manual to set RPM)	2	—	
2. Does adjustment of Voltage Adjusting knob for R22 on VR22 result in correct output voltage?	—	3	A
3. Does adjustment of potentiometer R26 on VR21 result in correct output voltage?	—	4	A
4. Is correct voltage reference V4 to V1, V2, or V3 on VR21 being used? Refer to Figure 6.	5	—	
5. Are generator output leads properly connected? Refer to Figure 6.	6	—	
6. Replace voltage regulator, PC board VR21	—	—	P

CAUTION **Do not replace the printed circuit board until the trouble not on the PC board has been located and corrected to avoid damage to new PC board.**

TABLE D. AC Output Voltage Builds Up, But Field Breaker Trips	Yes	No	Test Proc.
1. Does AC output voltage build up to 140% or more of rated voltage before Field Breaker trips?	2	7	—
2. Are there any loose or broken wires or connections on VR22?	—	3	
3. Is diode CR15 on VR21 OK?	4	—	G
4. Are T21 windings and connections OK?	5	—	J
5. Are generator stator leads properly connected? Refer to Figure 6.	6	—	—
6. Replace VR21.	—	—	P
7. Are diodes CR1, CR2, CR3, CR4, CR5, CR6 in rotating rectifier assemblies OK? Check all diodes - more than one may be defective.	8	—	F
8. Is brushless exciter stator winding OK?	9	—	K
9. Is generator rotor field winding OK?	10	—	M
10. Is brushless exciter rotor OK?	11	—	L
11. Are generator stator windings OK?	6	—	N

ADJUSTMENTS AND TESTS — REFERENCE LIST, pages 8-15.

A. VOLTAGE CALIBRATION ADJUSTMENT
B. VOLTAGE STABILITY ADJUSTMENT
C. BATTERY CHARGE RATE ADJUSTMENT
D. VOLTAGE REGULATOR CHECKOUT
E. FLASHING THE FIELD
F. TESTING ROTATING RECTIFIERS
G. TESTING OUTPUT BRIDGE DIODES
H. TESTING SCR'S
I. TESTING REACTOR
J. TESTING REFERENCE TRANSFORMER
K. TESTING EXCITER STATOR
L. TESTING BRUSHLESS EXCITER ROTOR (ARMATURE)
M. TESTING GENERATOR ROTOR
N. TESTING GENERATOR STATOR
O. WIRING HARNESS CHECK
P. VR21 REPLACEMENT

PART II CONTROL SYSTEMS

CONTROLS

The standard model AIR-COOLED and MARINE generating set control boxes (Figure 23) have a battery charge rate ammeter and a START-STOP switch on the front panel. Optional controls that may be added on the standard control panel include a fault lamp, an OVERSPEED indicator, a HIGH TEMPERATURE indicator, a LOW OIL PRESSURE indicator, a VOLT ADJUST knob, a PHASE-SELECTOR, and AC VOLTMETERS and AMMETERS. An optional side mount control panel and output lead box (Figure 24) is available for air-cooled sets only.

The control boxes on many RADIATOR-COOLED generating sets have an upper and a lower instrument panel door, Figure 25. Standard control components include a battery charge rate DC ammeter, a RUN-STOP-REMOTE switch, HEATER switch (diesel only), OIL PRESSURE gauge, WATER TEMPERATURE gauge, and a field circuit breaker. Optional controls that may be added on the upper door panel include three AC ammeters, an AC voltmeter, a running time meter, a phase selector

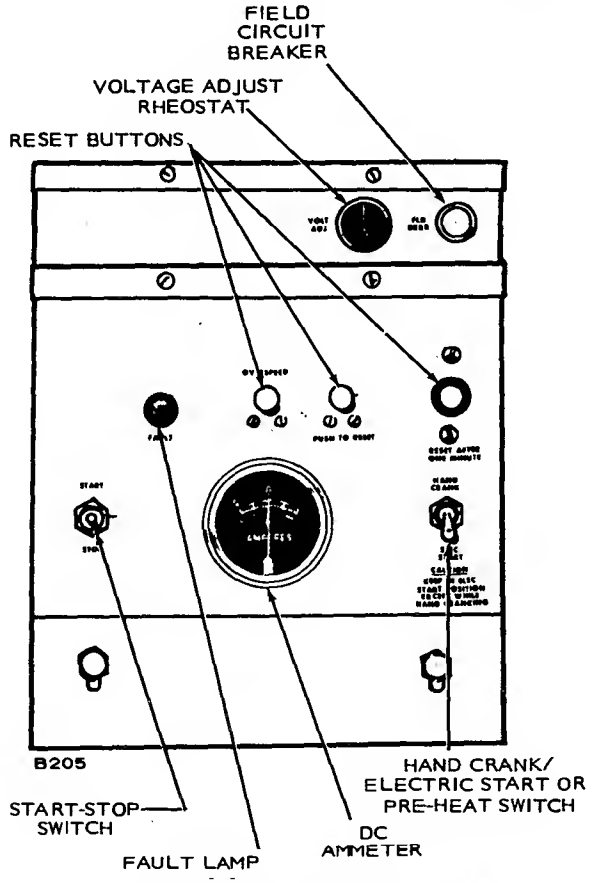


FIGURE 23. TYPICAL AIR-COOLED AND MARINE SET CONTROL PANEL

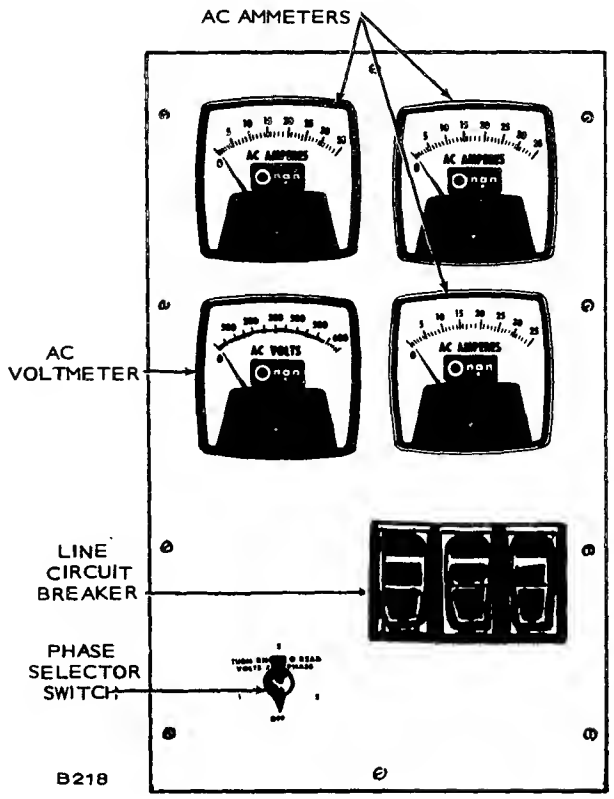


FIGURE 24. CONTROL PANEL AND OUTPUT BOX AIR-COOLED SET ONLY

switch, a 50 or 60 Hertz frequency meter, line circuit breakers, and a voltage regulator adjust knob. Optional controls that may be added on the lower panel door include a PLANT FAILED TO START fault lamp, a CRANKING LIMITER, and three fault indication lamps for LOW OIL PRESSURE, HIGH WATER TEMPERATURE, and OVERSPEED with their associated push button reset switches.

CONTROL PANEL COMPONENTS

The following is a brief description of typical controls and instruments on the face of the panels; these may vary according to the customer purchase order.

Standard

Start-Stop Switch: Starts and stops the unit locally.

Battery Charge Rate DC Ammeter: Indicates the battery charging current.

Field Circuit Breaker: Provides generator exciter and regulator protection from overheating in the event of

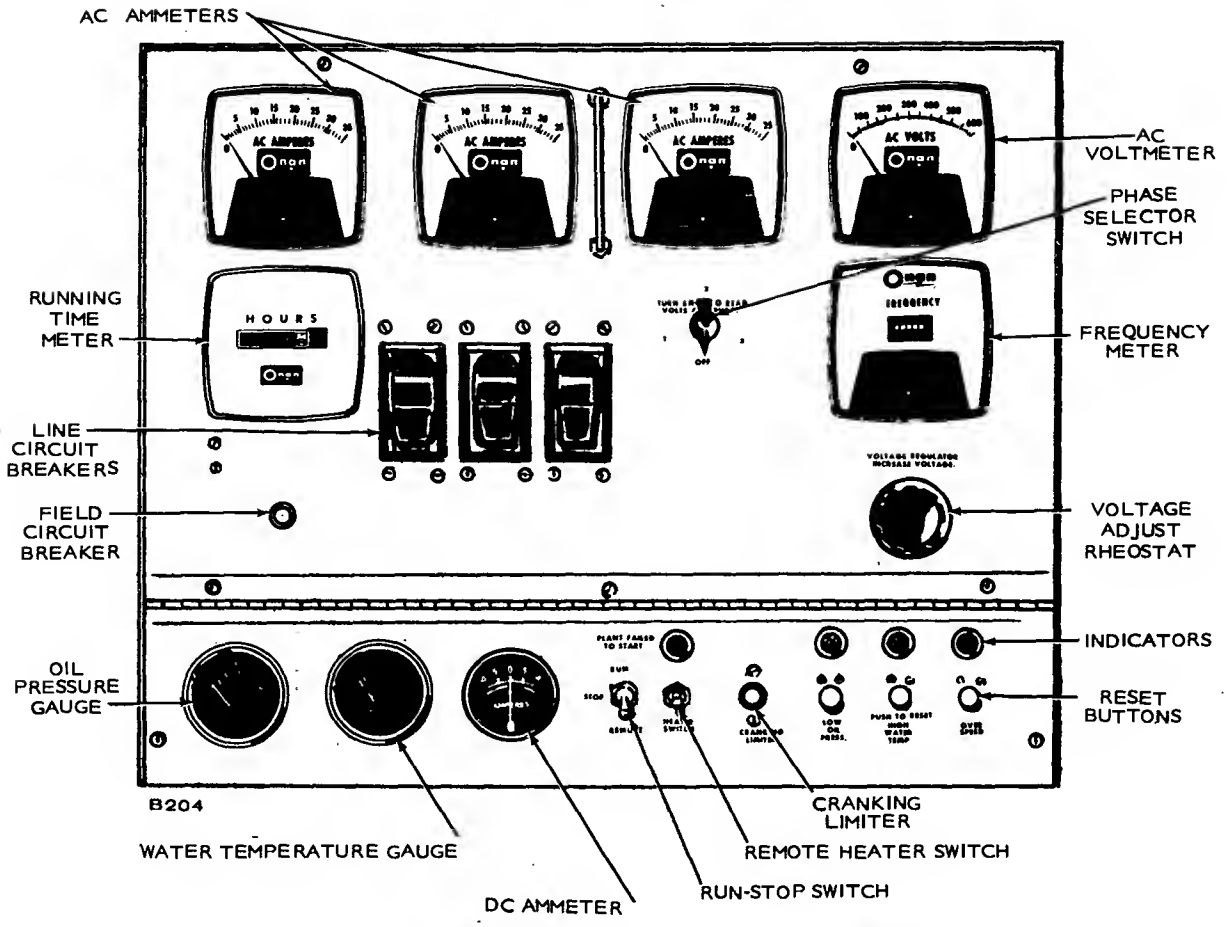


FIGURE 25. TYPICAL RADIATOR-COOLED SET CONTROL PANEL

certain failure modes of the generator, exciter, and voltage regulator.

Pre-Heat Switch: Provides pre-heat control for manifold heater and glow plugs for cold diesel engine starting.

Oil Pressure Gauge: Indicates pressure of lubricating oil in engine (wired to a sensor unit located on the engine).

Optional

AC Voltmeter: Indicates AC generator output voltage.

Voltmeter Phase Selector Switch: Selects the phases of the generator output to be measured by the AC voltmeter.

Voltage Adjust Rheostat: Provides approximately plus or minus 5 percent adjustment of the rated output voltage.

Cranking Limiter: Thermally actuated device limits cranking time to between 45 and 90 seconds depending on the ambient temperature. Red pushbutton pops out and cannot be reset until one minute has elapsed.

Running Time Meter: Registers the total number of hours, to 1/10th that the unit has run. Use it to keep a record for periodic servicing. Time is accumulative; meter cannot be reset.

Frequency Meter: Indicates the frequency of the generator output in hertz. It can be used to check engine speed. (Each hertz equals 30 rpm.)

Warning Lights: Four red indicator lights give warning of:

- Plant failed to start
- Overspeed
- Low oil pressure
- High engine temperature

Three reset pushbuttons permit restarting after trouble is corrected.

Line Circuit Breaker: Protects generator from line overloads.

Water Temperature Gauge: Indicates temperature of circulating coolant in engine. (Wired to a sensor unit located on the engine.)

CONTROL SYSTEM OPERATION

Dependable, trouble-free operation of the control system should be the major concern of any competent generator set serviceman. A serviceman must thoroughly understand how the controls operate, know how to check for troubles, and know how to make the proper adjustments, replacements, or repairs in a reasonable amount of time. The operating cycle includes starting, start-disconnect, running, stopping, and emergency shutdown functions.

CONTROL-OPERATION (AIR-COOLED AND MARINE SETS)

The circuitry, control components, and operating cycles for air-cooled and marine generating sets are similar, however the gasoline and diesel-powered sets are different enough to be described separately.

Prior to starting the generator set, check the fuel supply, engine oil level, and all battery connections for loose or broken wires. If an automatic demand control is in use, check for correct connections.

The following description of control operation includes optional equipment, shown in Figure 26, for both gasoline and diesel engine powered generator sets. The control on both types are similar, except for the options and the type of ignition used.

STARTING GASOLINE POWERED SETS

The start-stop switch is pressed and held at the START position until the engine starts and runs.

CAUTION **Do not hold switch longer than 45 seconds during any attempt to start. Longer periods will harm the starter motor windings.**

The start and run circuits (Figures 26 and 29) are DC circuits supplied by the 12 vdc battery and by the charge winding of the generator. The electrical functions are completed by grounding the 12 VDC back to the negative pole of the battery through the control circuits. Onan grounds the start-stop switches at terminal 1. Figure 27 shows a typical wiring diagram for gasoline powered sets described in the following starting, start-disconnect, and stopping sequences.

Starting Sequence

Press and hold start-stop switch S11 to START position. This connects battery voltage from B+ to the following switching relays and solenoids.

- Start solenoid relay K^{11}
- Primer solenoid K^{3}
- Start-Disconnect and fuel solenoid relay K^{12}
- Thermal Choke E^{2}
- Day Tank fuel solenoid K^{2}
- Fuel pump E^{1}
- Fuel solenoid K^{1} (if used in gasoline line)
- Emergency (low oil pressure) relay K^{14}

The following sequence of electrical functions occurs during the starting operation.

1. In the stopped condition, start-disconnect ignition relay K^{12} has normally closed contacts in the circuit to start relay K^{11}. Relay K^{12} has open contacts in the charging circuit to the breaker points (ignition system), fuel pump E^{1}, fuel solenoid relay K^{1}, thermal choke heater, and day tank fuel solenoid K^{2} circuits. Relay K^{11} also has normally open contacts in the ignition and starter motor circuits.
2. During starting, the start circuit is completed by start-stop switch S^{11} at the START position. This action energizes start relay K^{11}.
3. Start relay K^{11} has two sets of contacts. One set of K^{11} contacts close to energize primer solenoid K^{3}, thermal choke E^{2}, and starter motor shift solenoid B^{1} to engage the starter motor to the flywheel gear. In shifting, solenoid B^{1} closes internal contacts to energize the starter motor windings with battery voltage to crank the engine. The other set of K^{11} contacts close to complete the ignition circuit through high temperature switch S^{2} and breaker point assembly S^{3} and to energize the thermal choke heater and the following options: fuel pump E^{1}, fuel solenoid K^{1}, and day tank fuel solenoid K^{2}.
4. Relay K^{14} and LOP switch S^{4} are optional components. The seven second time delay heater in emergency relay K^{14} cannot energize until centrifugal switch S^{1} closes when 900 rpm's engine-generator speed is attained. Relay K^{14} energizes *only* if low oil pressure continues longer than the seven second time delay of the relay. The heater in K^{14} is energized through LOP switch S^{4} and 1-ohm current limiting resistor R^{12}, but only briefly until oil pressure builds up to open switch S^{4}. Should low pressure continue beyond the seven second time delay period, the heater in K^{14} melts solder in the solder pot releasing spring-operated contacts which close the circuit, thus energizing the coil of K^{14}. Contacts of K^{14} then open the ignition, fuel pump, fuel solenoid, thermal choke heater, and day tank fuel solenoid circuits to stop the engine.

If K^{14} should energize and stop the engine, a brief period is required for the relay's heater to cool before the relay contacts reset to the de-energized position for starting again.

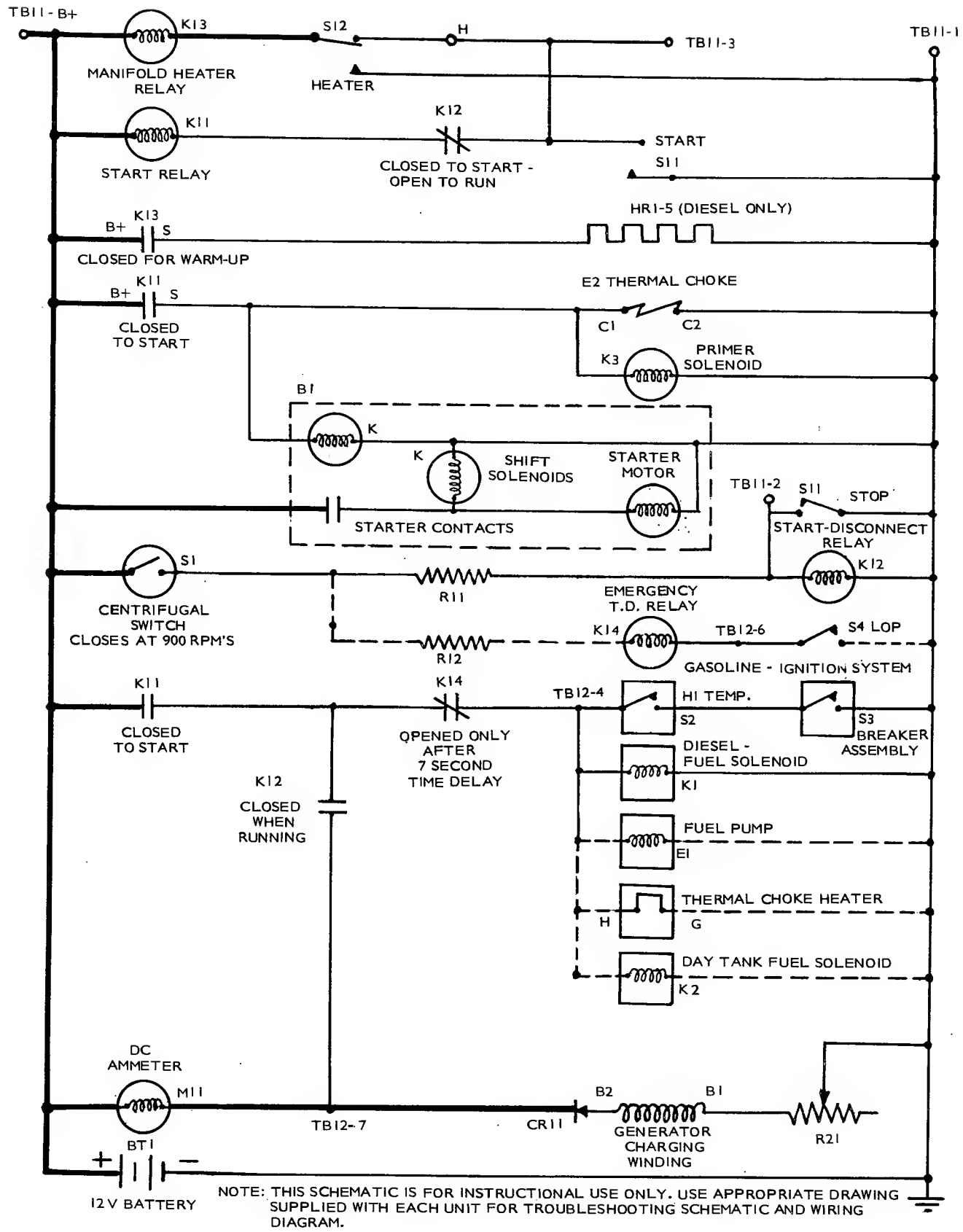
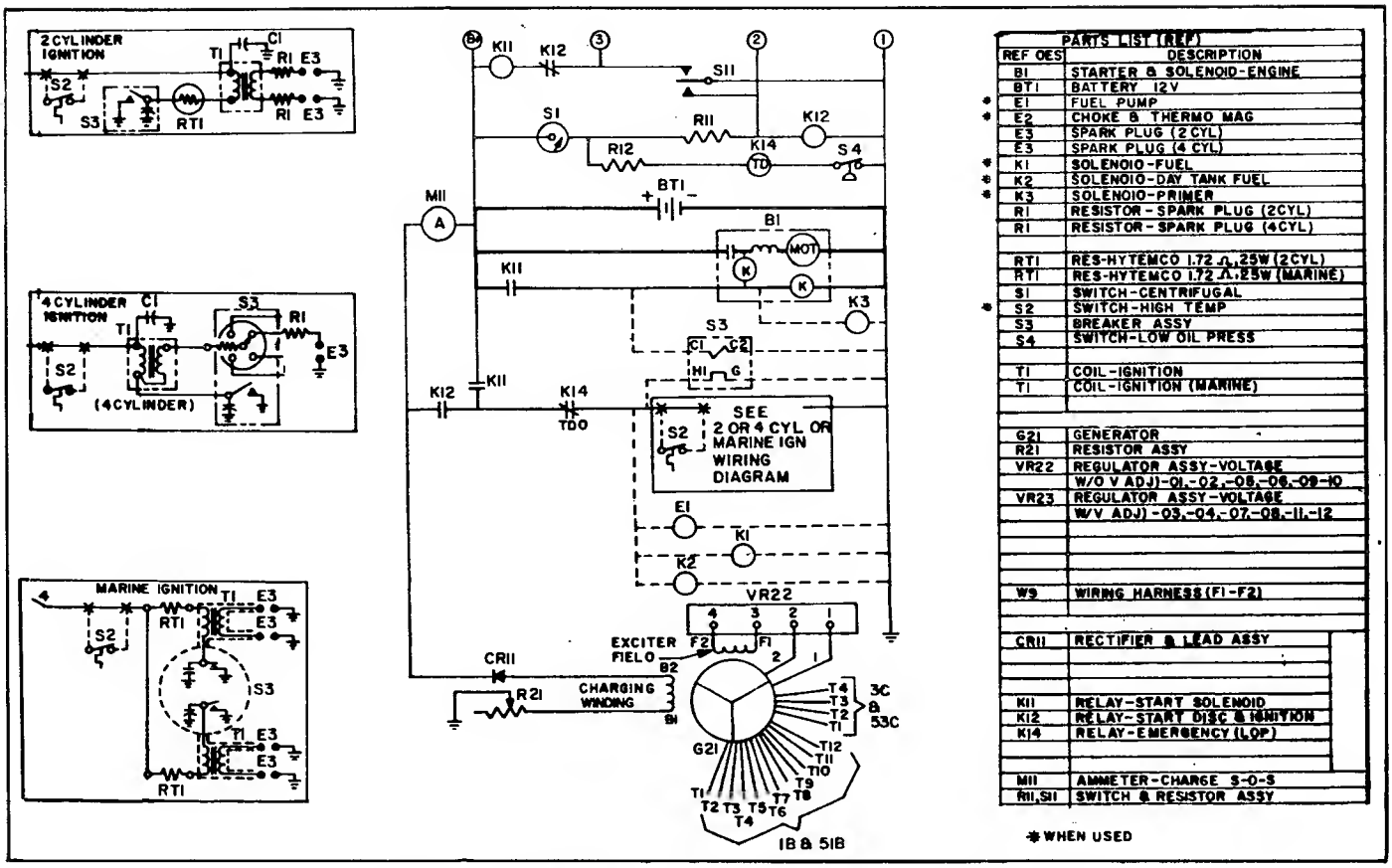


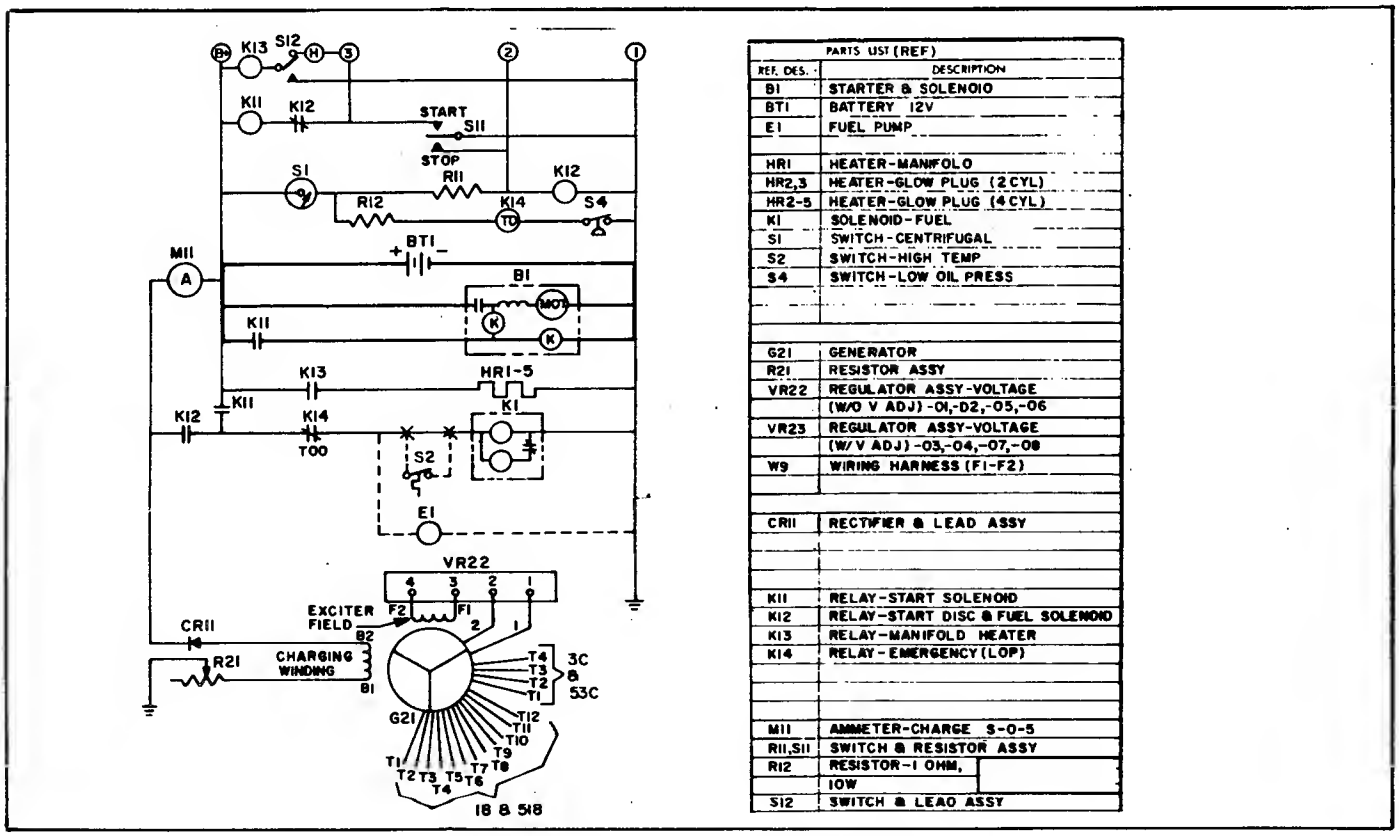
FIGURE 26. CONTROL CIRCUIT (INCLUDES OPTIONS) (AIR-COOLED AND MARINE)



PARTS LIST (REF)	
REF DES	DESCRIPTION
BI	STARTER & SOLENOID-ENGINE
BTI	BATTERY 12V
* EI	FUEL PUMP
* E2	CHOKE & THERMO MAG
E3	SPARK PLUG (2 CYL)
E3	SPARK PLUG (4 CYL)
* KI	SOLENOID-FUEL
* K2	SOLENOID-DAY TANK FUEL
* K3	SOLENOID-PRIMER
RI	RESISTOR-SPARK PLUG (2CYL)
RI	RESISTOR-SPARK PLUG (4CYL)
RTI	RES-HYTEMCO 1.72 Ω, 25W (2CYL)
RTI	RES-HYTEMCO 1.72 Ω, 25W (MARINE)
SI	SWITCH-CENTRIFUGAL
* S2	SWITCH-HIGH TEMP
S3	BREAKER ASSY
S4	SWITCH-LOW OIL PRESS
TI	COIL-IGNITION
TI	COIL-IGNITION (MARINE)
G2I	GENERATOR
R2I	RESISTOR ASSY
VR22	REGULATOR ASSY-VOLTAGE W/O V ADJ)-01,-02,-08,-06,-09-10
VR23	REGULATOR ASSY-VOLTAGE W/V ADJ)-03,-04,-07,-08,-11,-12
W9	WIRING HARNESS (F1-F2)
CRII	RECTIFIER & LEAD ASSY
KII	RELAY-START SOLENOID
KI2	RELAY-START DISC & IGNITION
KI4	RELAY-EMERGENCY (LOP)
MII	AMMETER-CHARGE S-0-S
RII,SII	SWITCH & RESISTOR ASSY

* WHEN USED

FIGURE 27. TYPICAL GASOLINE ENGINE CONTROL SCHEMATIC



PARTS LIST (REF)	
REF. DES.	DESCRIPTION
BI	STARTER & SOLENOID
BTI	BATTERY 12V
EI	FUEL PUMP
HRI	HEATER-MANIFOLD
HR2,3	HEATER-GLOW PLUG (2 CYL)
HR2-5	HEATER-GLOW PLUG (4 CYL)
KI	SOLENOID-FUEL
SI	SWITCH-CENTRIFUGAL
S2	SWITCH-HIGH TEMP
S4	SWITCH-LOW OIL PRESS
G2I	GENERATOR
R2I	RESISTOR ASSY
VR22	REGULATOR ASSY-VOLTAGE
	(W/O V ADJ)-01,-02,-05,-06
VR23	REGULATOR ASSY-VOLTAGE
	(W/V ADJ)-03,-04,-07,-08
W9	WIRING HARNESS (F1-F2)
CRII	RECTIFIER & LEAD ASSY
KII	RELAY-START SOLENOID
KI2	RELAY-START DISC & FUEL SOLENOID
KI3	RELAY-MANIFOLD HEATER
KI4	RELAY-EMERGENCY (LOP)
MII	AMMETER-CHARGE S-0-5
RII,SII	SWITCH & RESISTOR ASSY
RI2	RESISTOR-1 OHM, 10W
SI2	SWITCH & LEAD ASSY

FIGURE 28. TYPICAL DIESEL ENGINE CONTROL SCHEMATIC

Start-Disconnect Sequence:

Start-disconnect relay K^{12} and centrifugal switch S^1, through 15-ohm, 10-watt resistor R^{11} function to open the K^{11} starting circuit when engine speed reaches 900 rpm's. Relay K^{12} also completes the charging circuit which provides ignition voltage and holds fuel solenoid K^1 during continuous operation of the generator set.

When the engine starts, the following electro-mechanical functions occur.

1. Centrifugal switch S^1 closes at 900 rpm's to energize start-disconnect relay K^{12}. Contacts of K^{12} then close, holding fuel solenoid, fuel pump, thermal choke heater and day tank solenoid energized to continue supplying ignition and fuel to keep the engine running.
2. Contacts of K^{12} open in the start circuit to de-energize start relay K^{11} allowing the operator to release the start-stop switch.

Stopping Sequence:

Pressing and holding start-stop switch S^{11} at the STOP position shorts out the 12 VDC supply to start-disconnect and fuel solenoid relay K^{12} which de-energizes to open B+ and the charging circuit to fuel solenoid K^1, the ignition system, and the other fuel control components.

STARTING DIESEL POWERED SETS

First, the HEATER switch is pressed and held from 30-seconds up to two minutes in cold weather to energize the glow plugs and manifold heaters for engine warm-up. Second, the start-stop switch is pressed and held at the START position (Figures 26 and 28) until the engine starts and runs.

CAUTION **Do not hold start switch longer than 45 seconds during any attempt to start. Longer periods will harm the starter motor windings.**

Warm-Up:

1. Hold HEATER switch S^{12} to HEAT position. This action energizes the manifold heater solenoid (relay) K^{13} which then connects battery voltage to the glow plugs and manifold heater (HR^1 through HR^5) for engine warm-up.
   a. Normally, only apply heat for 30 seconds.
   b. In cold weather (below 55°F) apply heat for one to two minutes.
2. Release heater switch S^{12}.

After S^{12} is released to OFF position, this switch and relay K^{13} continue to apply heat as long as S^{11} is at START position.

Starting Sequence:

Press and hold start-stop switch S^{11} to START position. This connects battery voltage from B+ to the following switching relays and solenoids to energize their coils.

a. Start solenoid relay K^{11}
b. Start-disconnect and fuel solenoid relay K^{12}
c. Fuel solenoid K^1
d. Emergency (low oil pressure) relay K^{14} (optional)
e. Fuel pump E^1 (optional)

The following sequence of electrical functions occur during the starting operation.

1. In the stopped condition, relay K^{12} contacts are normally closed in the circuit to start relay K^{11}. Relays K^{11} and K^{12} also have normally open contacts in the circuit to fuel solenoid K^1 and fuel pump E^1.

   Relay K^{11} energizes when the start circuit is completed by start-stop switch S^{11} at the start position.

2. Relay K^{11} then closes contacts in the circuit to seven second time delay relay K^{14}, but this emergency circuit is not completed until centrifugal switch S^1 closes when 900 rpm's generator speed is attained.
3. In the start condition, contacts of K^{11} close to energize starter shift solenoid B^1 to engage the starter motor to the flywheel gear. In shifting, solenoid B^1 closes internal contacts to energize the starter motor windings with battery voltage to crank the engine.
4. Relay K^{11} also closes contacts to energize fuel pump E^1 and fuel solenoid K^1. Solenoid K^1 then allows the governor to position the fuel metering sleeve in the injection pump to full fuel position.
5. Relay K^{14} energizes only if low oil pressure continues longer than the seven second time delay of the relay. The heater in K^{14} is energized through LOP switch S^4 and 1-ohm current limiting resistor R^{12} until oil pressure builds up to open LOP switch S^4. Should low oil pressure continue beyond the seven second time delay period, the heater in K^{14} melts solder in the solder pot releasing spring operated contacts which close the circuit, thus energizing K^{14}. Contacts of K^{14} then open the circuit to de-energize fuel pump E^1 and fuel solenoid K^1 which shuts off the fuel supply and stops the engine.

Start-Disconnect Sequence:

Start-disconnect relay K^{12}, energized by centrifugal switch S^1 through 15-ohm 10-watt resistor R^{11}, functions to de-energize K^{11} by opening contacts in the starting circuit when engine speed reaches 900 rpm's. It also closes contacts connecting B+ and the charging circuit supply to fuel pump E^1 and fuel solenoid K^1

to keep them energized during continuous operation of the generator set.

After the engine starts, the following electro-mechanical functions occur.

1. Centrifugal switch S^1 closes to energize start-disconnect fuel solenoid relay K^{12}. Contacts of K^{12} then close, holding fuel solenoid K^1 and the fuel pump E^1 energized to continue the fuel supply that keeps the engine running.
2. Contacts of K^{12} open in the start circuit to de-energize start relay K^{11} allowing the operator to release the start-stop switch.

Stopping Sequence:

Pressing and holding start-stop switch S^{11} at the STOP position shorts out the 12 VDC supply to start-disconnect and fuel solenoid relay K^{12} which de-energizes to open the circuit to the fuel pump and fuel solenoid. The shaft of the fuel solenoid then applies force to the injection pump control arm and thus positions the fuel metering valve sleeve to the NO FUEL position. The engine then stops due to lack of fuel.

CONTROL-OPERATION (RADIATOR-COOLED DIESEL SETS)

The control components on the radiator-cooled, diesel-powered sets are similar to the air-cooled and marine set, but the circuitry and operating cycles are different. The component designations are also different.

Prior to starting, check the fuel supply, engine oil level, and all battery connections for loose or broken wires. If an automatic demand control is in use, check for correct connections and make sure the selector switch is at REMOTE.

Starting:

Manually positioning SELECTOR switch S^{12} controls engine starting by connecting the 12 VDC battery voltage to the control circuit components. The electrical functions are completed by grounding the 12 VDC back to the negative pole of the battery. Switch S^{11} turns on the control panel lights, Figure 29.

Starting Sequence:

The starting sequence begins at switch S^{12} in the RUN or REMOTE POSITION. In the RUN position, the engine is started by the operator at the set. First, MANIFOLD HEATER switch S^{13} is pressed and held to the HEAT position to energize manifold heater HR^1 and glow plugs HR^2 through ^{5}. Second, S^{12} is positioned to RUN and the automatically controlled start, run, and emergency stop circuits take over to operate the engine.

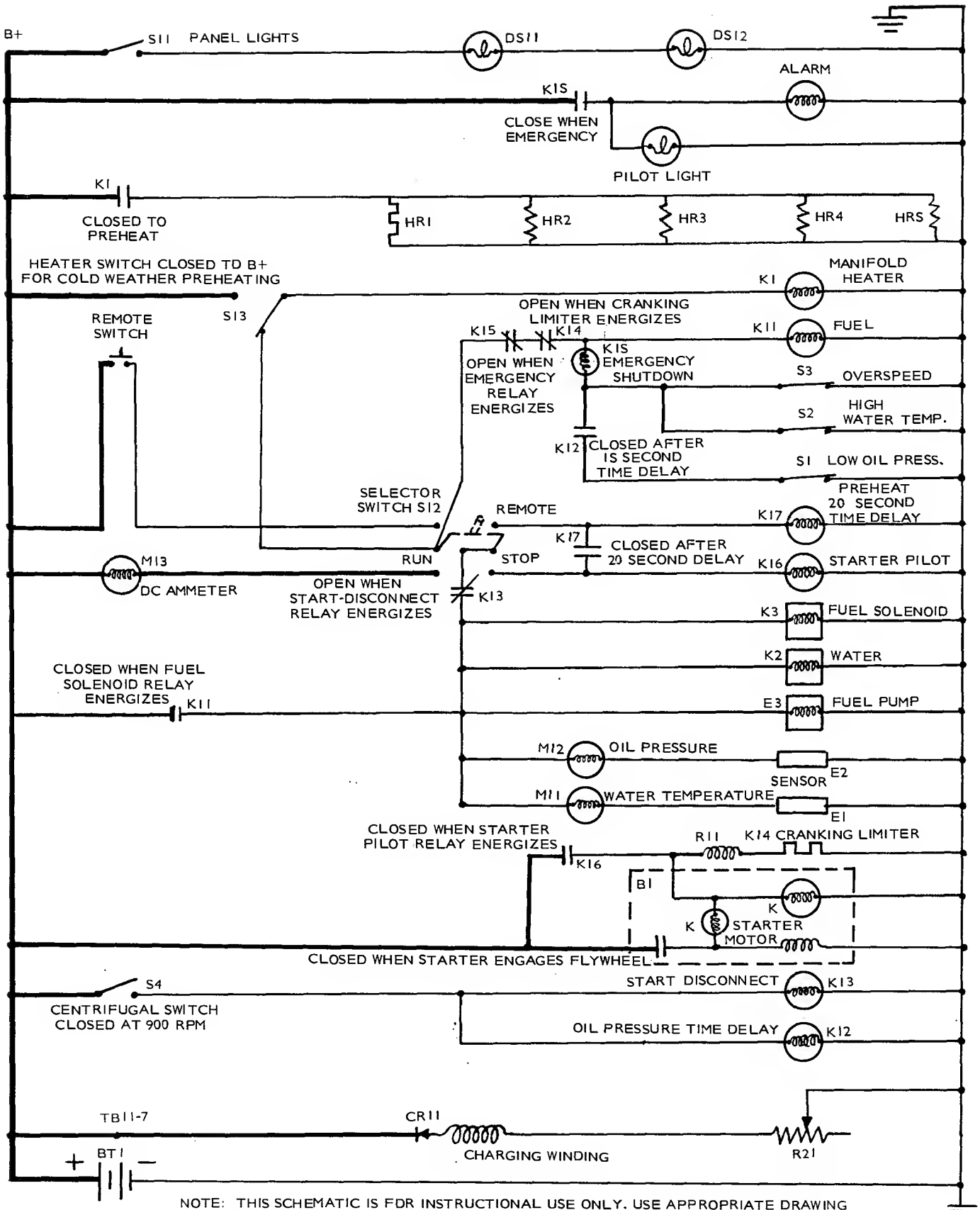
With S^{12} in the REMOTE position, the engine is started by the operator using a remote switch from a remote location or by an automatic demand control device. In either case, engine preheating is controlled by 20 second time delay relay K^{17} which functions automatically during the first part of the start cycle. Relay K^{17} is energized by B+ through the remote switch and switch S^{12} at REMOTE.

Switch S^{12} at RUN or REMOTE and contacts of relay K^{11} connect battery voltage to the following switching relays and solenoids to energize their coils.

- Fuel solenoid relay K^{11}
- Preheat 20 second time delay relay K^{17}
- Starter pilot relay K^{16}
- Cranking limiter relay K^{14}
- Fuel pump E^3 (when used)
- Fuel solenoid K^3
- Water valve solenoid K^2 (when used)
- Starter solenoids and starter motor B^1

The following electrical and mechanical functions occur in sequence during the starting operation with switch S^{12} in the RUN position.

1. At RUN (or REMOTE), the left hand blade of S^{12} connects 12 VDC from B+ to energize fuel solenoid relay K^{11}. Contacts of K^{11} then close to connect B+ to the right hand blade of S^{12} and starter pilot relay K^{16}.
   a. Contacts of K^{16} then close to energize cranking limiter 45 second time delay relay K^{14} through 3-ohm 10-watt resistor R^{11} to prevent over-cranking whenever the engine does not start immediately.
   b. The normally closed contacts of K^{14} remain closed in the emergency circuit while the cranking limiter time delay relay is heating and only open whenever K^{14} actually energizes to deactivate the fuel solenoid and emergency shutdown relays.
   c. Switch S^{12} at RUN, also connects B+ voltage to the starter shift solenoid B^1 through the normally closed contacts of K^{13} while the normally closed contacts of S^{13} complete the circuit between S^{12} and manifold heater solenoid K^1 for engine warm-up.
   d. Energizing relay K^1 closes its normally open contacts to energize manifold heater HR^1 and glow plugs HR^2 through ^{5} to warm the combustion air intake area of the engine during starting.
   e. During cold weather, S^{13} must be positioned by the operator at the set to energize the preheat circuit prior to positioning S^{12} to RUN.
2. When energized, solenoid B^1 shifts the starter motor pinion into engagement with the flywheel gear and the shift action closes internal contacts to energize the starter motor windings with battery voltage that cranks the engine.



NOTE: THIS SCHEMATIC IS FOR INSTRUCTIONAL USE ONLY. USE APPROPRIATE DRAWING SUPPLIED WITH EACH UNIT FOR TROUBLESHOOTING SCHEMATIC AND WIRING DIAGRAM.

FIGURE 29. RADIATOR-COOLED DIESEL-POWERED ENGINE CONTROL

3. Energizing fuel solenoid relay K^{11} closes its normally open contacts to keep the engine running after the start-disconnect relay de-energizes by holding the following components energized during the run condition.

- Fuel solenoid K^3
- Fuel pump E^1 (if used)
- Water valve solenoid K^2
- Oil pressure gauge M^{11} and sensor E^1
- Water temperature gauge M^{12} and sensor E^2.

Start-Disconnect Sequence:

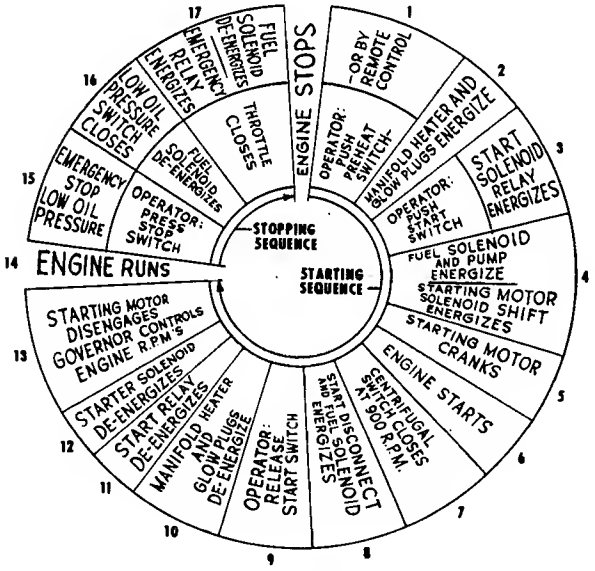
After the engine starts and attains 900 rpm's, centrifugal switch S^4 closes completing the run circuit by energizing start-disconnect relay K^{13} and oil pressure 15 second time delay relay K^{12}. Relay K^{12} allows time for oil pressure to build up during starting and prevents engagement of the starter pinion and flywheel gear, during successive attempts to crank the engine, while the flywheel is still rotating.

Stopping:

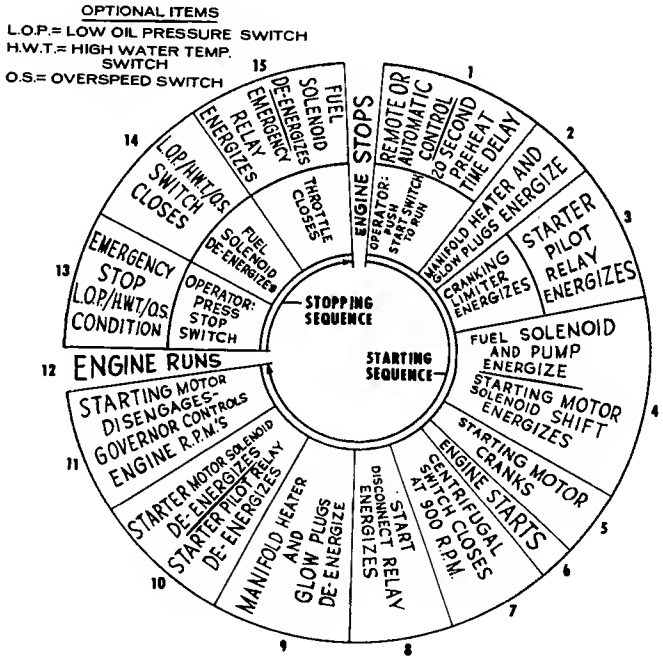
Positioning selector switch S^{12} to STOP position disconnects B+ voltage from the control circuits; thereby de-energizing all control components required to operate the engine in either RUN or REMOTE condition.

EMERGENCY SHUTDOWN

Emergency shutdown relay K^{15} is controlled by any of three normally closed switches: S^1 low oil pressure, S^2 high water temperature, and S^3 overspeed. Contacts of K^{15} control two circuits: one normally closed set of K^{15} contacts controls the fuel solenoid relay coil to shut off the fuel supply to the engine; the other normally open set closes to light the pilot light and set off the emergency alarm whenever the emergency shutdown relay energizes.



AIR-COOLED AND MARINE SETS



RADIATOR-COOLED SETS

DIESEL ENGINE OPERATING CYCLE

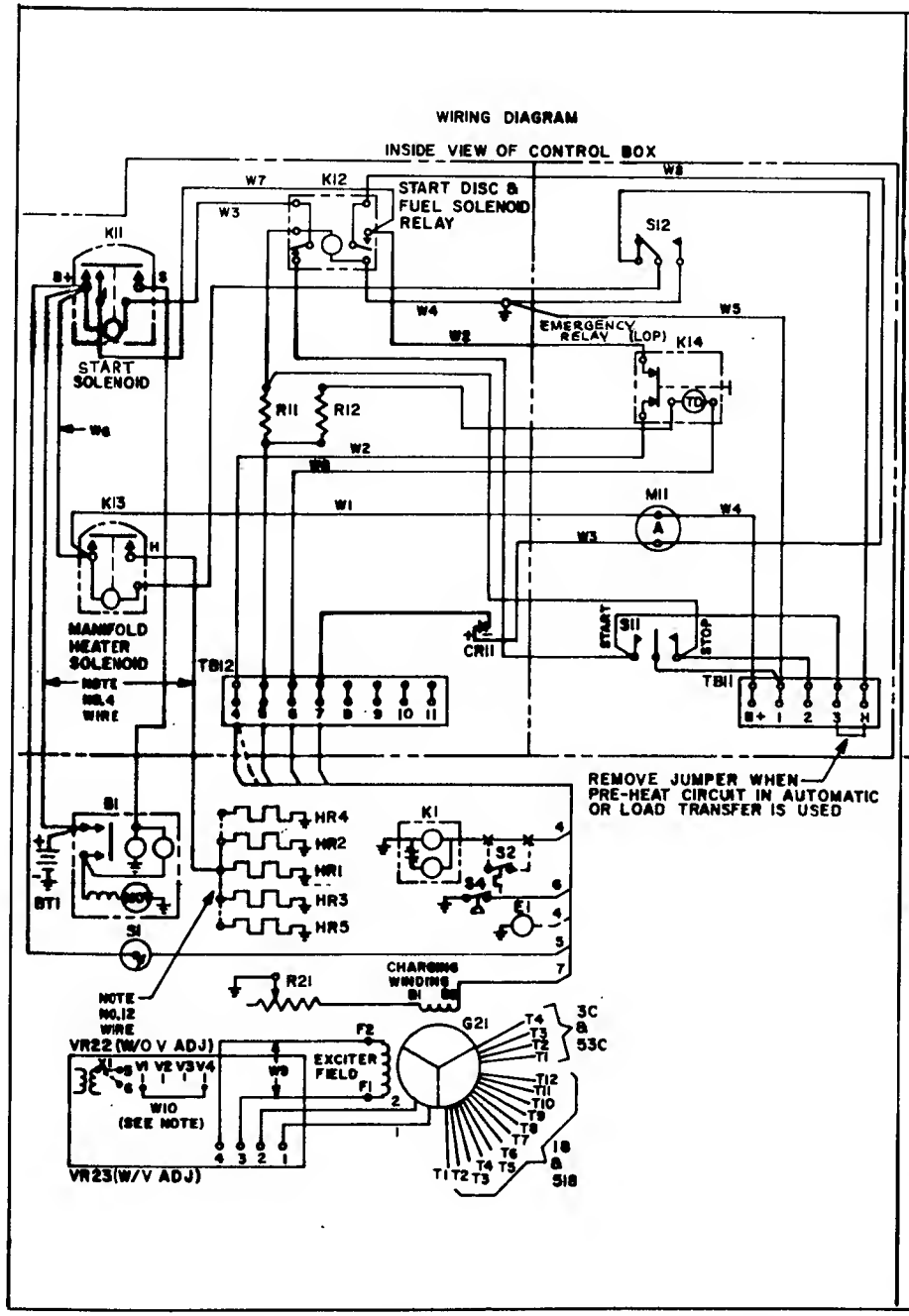


FIGURE 30. TYPICAL DIESEL ENGINE GENERATOR CONTROL WIRING DIAGRAM

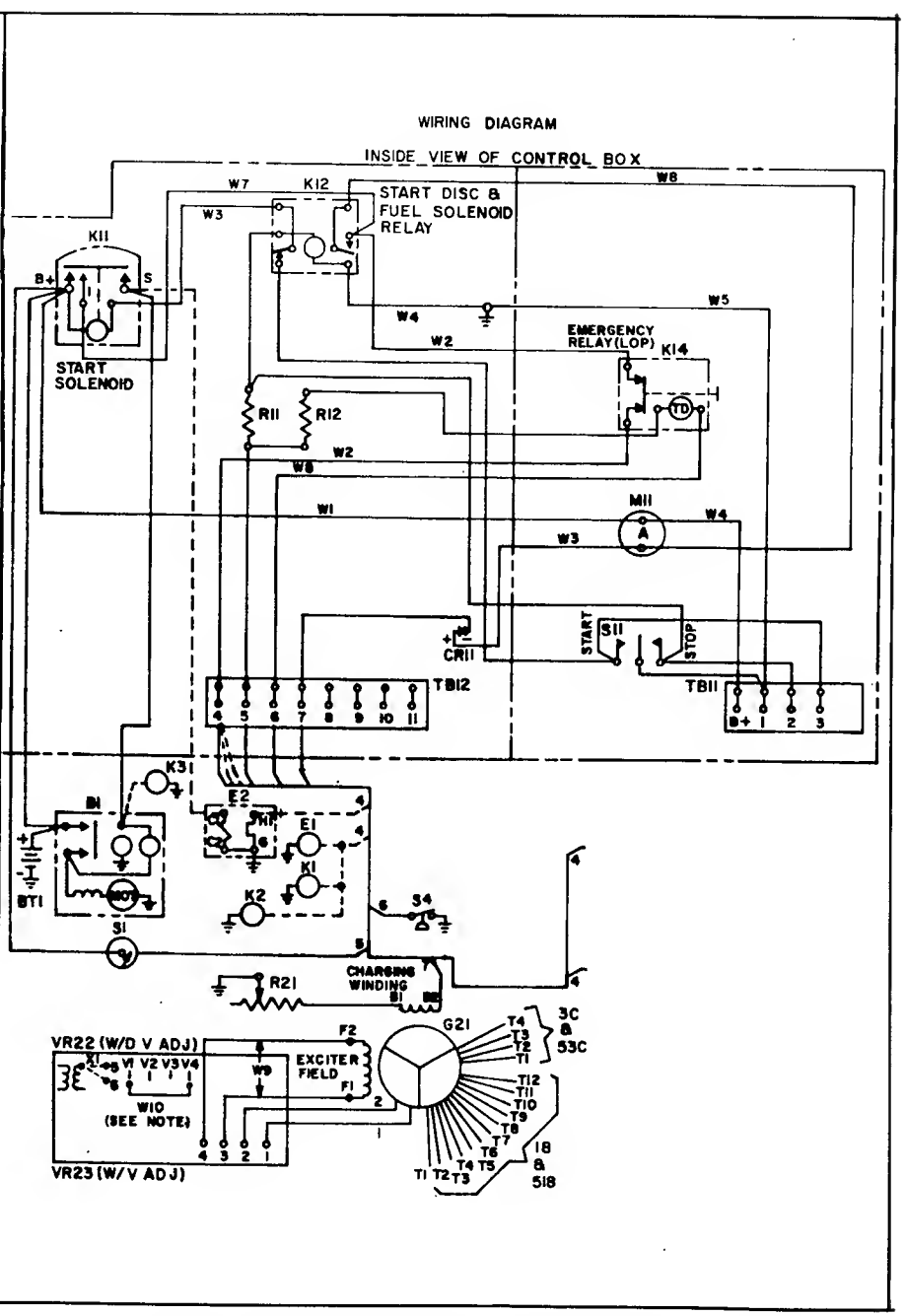


FIGURE 31. TYPICAL GASOLINE ENGINE GENERATOR CONTROL WIRING DIAGRAM

CONTROL TROUBLESHOOTING

ENGINE CONTROLS - TROUBLESHOOTING

This troubleshooting information is divided into four tables, A, B, C, and D as follows:

A. Engine does not crank.
B. Engine cranks but does not start.
C. Engine starts but stops when start switch is released.
D. Battery loses excess water.

Preparation:

In the event a troubleshooting procedure has to be initiated, it is possible that a few simple checks could expose the probable problem source or at least cut down on troubleshooting time.

1. Check all modifications, repairs, replacements performed since last satisfactory operation of set. A loose wire connection, overlooked when installing a replacement part could cause problems. An incorrect connection, an opened switch or circuit breaker, or a loose plug-in are all potential malfunction areas to be eliminated by a visual check.
2. Unless absolutely sure that panel instruments are accurate, use portable test meters for troubleshooting.

The question and troubleshooting guide which follows, gives a step-by-step procedure for checking the generator, etc.

To correct a problem, answer the question of the step either YES or NO. Then refer to the step number in the answer column and proceed to that step next. Refer to test procedure letter for component checkout information that follows tables. Refer to typical wiring diagrams in Figures 30 and 31 for locating control component leads, terminals, and other check points.

Voltage Check Points:

The voltages listed below indicate normal conditions. Check all terminal block terminals for correct voltages between terminal and ground using a DC voltmeter on 12V battery system.

TB11-B+ ..... 12 VDC
TB11-1 ..... GROUND
TB11-2 ..... 12 VDC
TB11-3 ..... 12 VDC
TB11-H ..... 12 VDC
TB12-4 ..... 12 VDC RUNNING
TB12-5 ..... 12 VDC RUNNING
TB12-6 ..... O-VDC RUNNING, 12 VDC STOPPED
TB12-7 ..... 19 to 21 VAC
TB21-1 to 2 ..... 120 to 139 VAC
K11-B+ ..... 12 VDC
K11-S ..... 12 VDC ON STARTING
K13-H ..... 12 VDC ON WARMUP

TABLE A. Engine Does Not Crank	Yes	No	Test Proc.
1. Check 12 VDC to ground at battery BT1 and at starter motor B1. Check B+ present at TB11, K11, K13, S1, and M11.	—	—	
2. Check battery cables for polarity and tightness at battery and starter motor.	—	—	
3. Is battery dead? Check if centrifugal switch S1 is open to ground. If S1 remains closed when set is shutdown, R11 and K14 will discharge through S4 to ground. Remove switch cover and check operation manually.	4		A, G, H
4. Replace S4. Replace or charge battery.	—	—	
5. Jumper battery cable connection to ground at starter. Does engine crank?	7	6	
6. Check starter motor. Repair or replace.			B
7. With S11 at START, is at least 7 volts present between terminal S on K11 and ground. Does K11 energize?	8		
8. Does manual operation of K11 crank engine?	9		
9. Jumper K11 from B+ to S terminal. Does engine crank?	10		
10. Start relay K11 is defective; replace.			D

TABLE A. (continued)	Yes	No	Test Proc.
11. With S11 at START, jumper K11 contacts to starter solenoid. Does engine crank?	11A	12	G
11A. Replace K11.			
12. With S11 at START, jumper normally closed contacts of K12. Does engine crank and start?	13		G
13. Replace K12.			

TABLE B. Engine Cranks But Does Not Start	Yes	No	Test Proc.
1. Is 12 VDC present between start terminal on S11 and ground (TB11-1) with S11 at START?		2	G
2. Is 12 VDC present between M11- B+ and ground TB11-1 with S11 at START? Check Wire W3 & W8.	3	4	
3. Replace faulty switch S11.	—	—	
4. Does engine operate on gasoline? Is fuel primer solenoid K3 energized when S11 is at START?	—	6	
5. Does engine operate on diesel fuel? Did glow plugs and manifold heater warm engine on pre-heat attempt with S12.		6	
6. Does fuel pump and fuel solenoid operate when S11 is at START?		7	D
7. Fuel solenoid and pump must operate during cranking and running. Remove fuel line from carburetor or injector pump and press S11. Does fuel pulsate from fuel line? **WARNING** Use extreme care for this test. Run fuel into a suitable container and make sure area is well ventilated to prevent accumulation of gasoline fumes.		8	

TABLE B. (continued)	Yes	No	Test Proc.
8. Remove fuel solenoid from fuel line and press S11. Does fuel pulsate from line?		9	
9. Check lead from TB12-4 to fuel pump; check fuel pump and replace if necessary.	—	—	
10. Check engine oil level. If okay, remove LOP switch S4 lead at TB12-4. Does engine crank and run when S11 is pressed?		11	
11. Is lead 6 from TB12-6 to LOP switch S4 grounded?		12	G
12. Repair or replace lead 6 to S4.			
13. Check switch S4; replace if necessary.			G

TABLE C. Engine Starts But Stops When Start Switch is Released	Yes	No	Test Proc.
1. Connect voltmeter from TB12-7 to ground. Is K12 energized with S11 at START?	2		D
2. Is charge winding producing DC voltage? If AC voltage is present, replace CR11.	3		C
3. Jumper contacts of K12 for gasoline ignition circuit check. Does engine start and run?		5	E
4. Jumper contacts of K12 for diesel fuel solenoid relay K1 circuit. Does engine start and run?		5	E
5. Replace K12.	—	—	—
6. Check charge resistor R21 and charging circuit connections.			F

TABLE C. (continued)	Yes	No	Test Proc.
7. Is charging ignition-fuel solenoid voltage present from TB12-7 to ground after engine starts and S11 is released?			C
TABLE D. Battery Loses Excess Water	**Yes**	**No**	**Test Proc.**
1. Connect a voltmeter (one percent accuracy or better) to battery terminals, start and run generator set for 30 minutes. Does battery terminal voltage exceed: a. 14 volts at 100 F or above; or b. 15 volts at 50 to 100 F; or c. 16 volts at 50 F or below?			A

COMPONENT CHECKOUT REFERENCE LIST, page 34.

A. BATTERY
B. STARTER MOTOR
C. RECTIFIER
D. SOLENOID
E. RELAY
F. RESISTOR
G. SWITCH
H. CENTRIFUGAL SWITCH

CONTROL COMPONENT CHECKOUT

The following procedures are provided as an aid to checking and isolating control circuit problems caused by faulty engine control components. Poor cranking performance can be caused by a faulty starter motor, defective battery, or high resistance and grounds in the starting circuit.

[A]

BATTERY CHECKOUT

Check the charge condition of the battery with a hydrometer.

Specific gravity should be between 1.290 and 1.225 when 75 percent charged. If not, recharge the battery. Check electrolyte level. Add approved water to keep electrolyte at its proper level. If battery will not recharge, replace it. Keep battery connections tight and clean.

[B]

STARTER MOTOR CHECKOUT

With the starting motor operating, check the voltage drops (1) from the battery ground terminal post (not the cable clamp) to the cylinder block, (2) from the cylinder block to the starting motor frame and (3), from the battery positive post to the battery terminal stud on the solenoid. Normally, each of these should be less than two volts. If extra long battery cables are used, slightly higher voltage drops may result. Thoroughly clean all connections in any part of the circuit showing excessively high voltage drops.

[C]

RECTIFIER CHECKOUT

Disconnect one lead from, or remove, each rectifier for its individual test.

CAUTION **Note carefully the direction of mounting of any rectifier removed. It must be remounted in its original direction.**

1. Connect the ohmmeter across the rectifier contacts and observe the meter reading.
2. Reverse the connections and compare the new reading with the first reading.
3. If one reading is considerably higher than the other reading, the rectifier can be considered satisfactory. However, if both readings are low, or if both indicate an "open" circuit, replace the rectifier with a new identical part.

[D]

SOLENOID CHECKOUT

1. Apply 12 volts to terminal marked BATTERY.
2. Jumper a ground wire to terminal marked "S".
3. Solenoid should activate.
4. If solenoid is good 12 volts can be read between terminal S^1 and ground.

[E]

RELAY CHECKOUT

1. Connect 12 volts on one side of relay coil and ground other side. If coil activates, relay is operating.
2. Connect a 12 volt source to one side of relay contacts.
3. Connect a voltmeter to other side of relay contact and to ground. If 12 volts appears when relay is energized, relay is good.
4. If relay has more than one set of contacts, each set must be checked.

[F]

RESISTOR CHECKOUT

1. Remove battery B+ cable.
2. Disconnect one side of resistor and using an ohmmeter measure across resistor for an accurate reading.

[G]

SWITCH CHECK

1. Remove battery B+ cable.
2. Place ohmmeter leads across switch.
3. Activate switch. If meter reads continuity, switch is good.

[H]

CENTRIFUGAL SWITCH CHECK

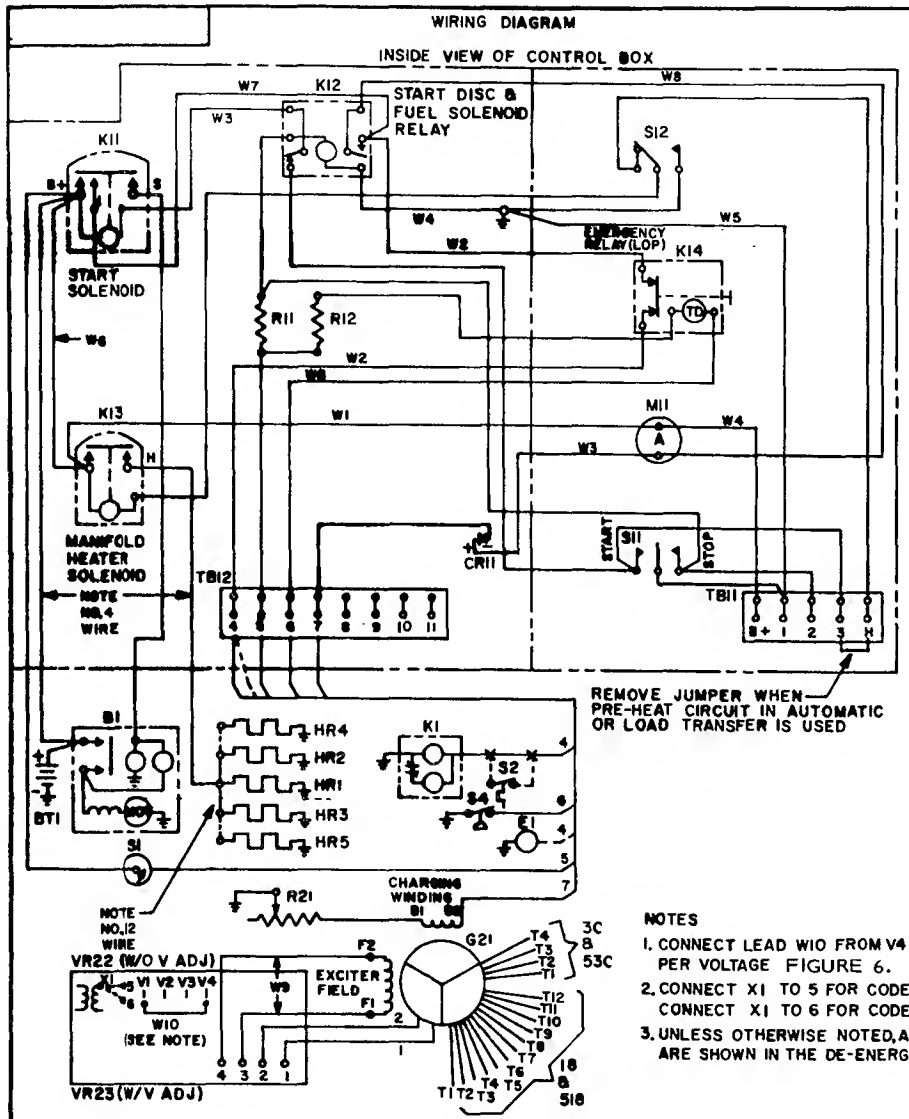
The start-disconnect switch is located on the gear cover on the side of the engine above the oil filter. The switch opens when the engine stops and closes when the engine speed reaches about 900 rpm . Check the switch contacts for pitting. If necessary, loosen the stationary contact and adjust the point gap at 0.040 inches. Replace burned or faulty points.

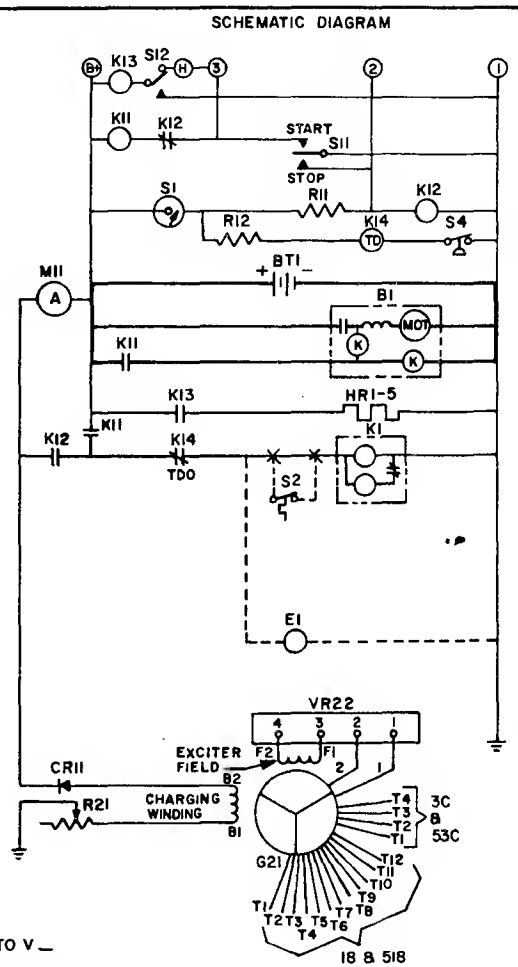
WIRING DIAGRAMS

The wiring and schematic diagrams in this section represent J-Series air-cooled, marine, and radiator cooled engine and 4.5-through 17.5KW YD generator configurations beginning with Spec AA. Wiring diagrams for special order generator sets are shipped with the units and are included in the applicable J-Series service manuals when they are updated. The index below lists the drawing and page numbers for the basic and some special J-Series engine-generator control unit wiring diagrams and electrical schematics.

See Figure 6 for voltage code 18, 518, 3C, 53C, and 9X reconnection data.

NOTE: Special order generator sets with optional specification codes such as, 4R-, 4XR-, and 5DR - 60 Hertz; 5R and 55R - 50 Hertz; and many others are basic 18R - 60 Hertz or 518R - 50 Hertz and 3C - 60 Hertz or 53C - 50 Hertz generators. Optional meter equipment and voltage output capabilities change the specification codes of these units and each wiring arrangement is slightly different.





NOTES

1. CONNECT LEAD W10 FROM V4 TO V_ PER VOLTAGE FIGURE 6.
2. CONNECT X1 TO 5 FOR CODE 53C & 518(50HZ) CONNECT X1 TO 6 FOR CODE 3C & 18(60HZ)
3. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION.

PARTS LIST (REF)

REF. DES.	DESCRIPTION
B1	STARTER & SOLENOID
BT1	BATTERY 12V
* E1	FUEL PUMP
HR1	HEATER-MANIFOLD
HR2,3	HEATER-GLOW PLUG (2 CYL)
HR2-5	HEATER-GLOW PLUG (4 CYL)
K1	SOLENOID-FUEL
S1	SWITCH-CENTRIFUGAL
S2	SWITCH-HIGH TEMP
* S4	SWITCH-LOW OIL PRESS
G21	GENERATOR
R21	RESISTOR ASSY
VR22	REGULATOR ASSY-VOLTAGE (W/O V ADJ) -01,-02,-05,-06
VR23	REGULATOR ASSY-VOLTAGE (W/V ADJ) -03,-04,-07,-08
W9	WIRING HARNESS (F1-F2)
CR11	RECTIFIER & LEAD ASSY
K11	RELAY-START SOLENOID
K12	RELAY-START DISC & FUEL SOLENOID
K13	RELAY-MANIFOLD HEATER
K14	RELAY-EMERGENCY (LOP)
M11	AMMETER-CHARGE 5-0-5
R11,S11	SWITCH & RESISTOR ASSY
R12	RESISTOR-1 OHM, 10W
S12	SWITCH & LEAD ASSY
TB11	TERMINAL BLOCK
TB12	TERMINAL BLOCK
W1	LEAD ASSY
W2	LEAD ASSY
W3	LEAD ASSY
W4	LEAD ASSY
W5	LEAD ASSY
W6	JUMPER
W7	LEAD ASSY
W8	LEAD ASSY

* WHEN USED

DJB, DJC, MDJC, MDJE, AND MDJF MODELS WITH LOW OIL PRESSURE SWITCH

DIESEL

MARINE

MODEL NO.
4.5 & 9.0KW-53CR/96AA
4.5 & 9.0KW-518R/96AA
6.0 & 12.0KW-3CR/96AA
6.0 & 12.0KW-18R/96AA
6.0,10.0 & 12.0KW-53CR/IAA
6.0,10.0 & 12.0KW-518R/IAA
7.5,12.0 & 15.0KW-3CR/IAA
7.5,12.0 & 15.0KW-18R/IAA
1 & 3 PH, 50 & 60HZ

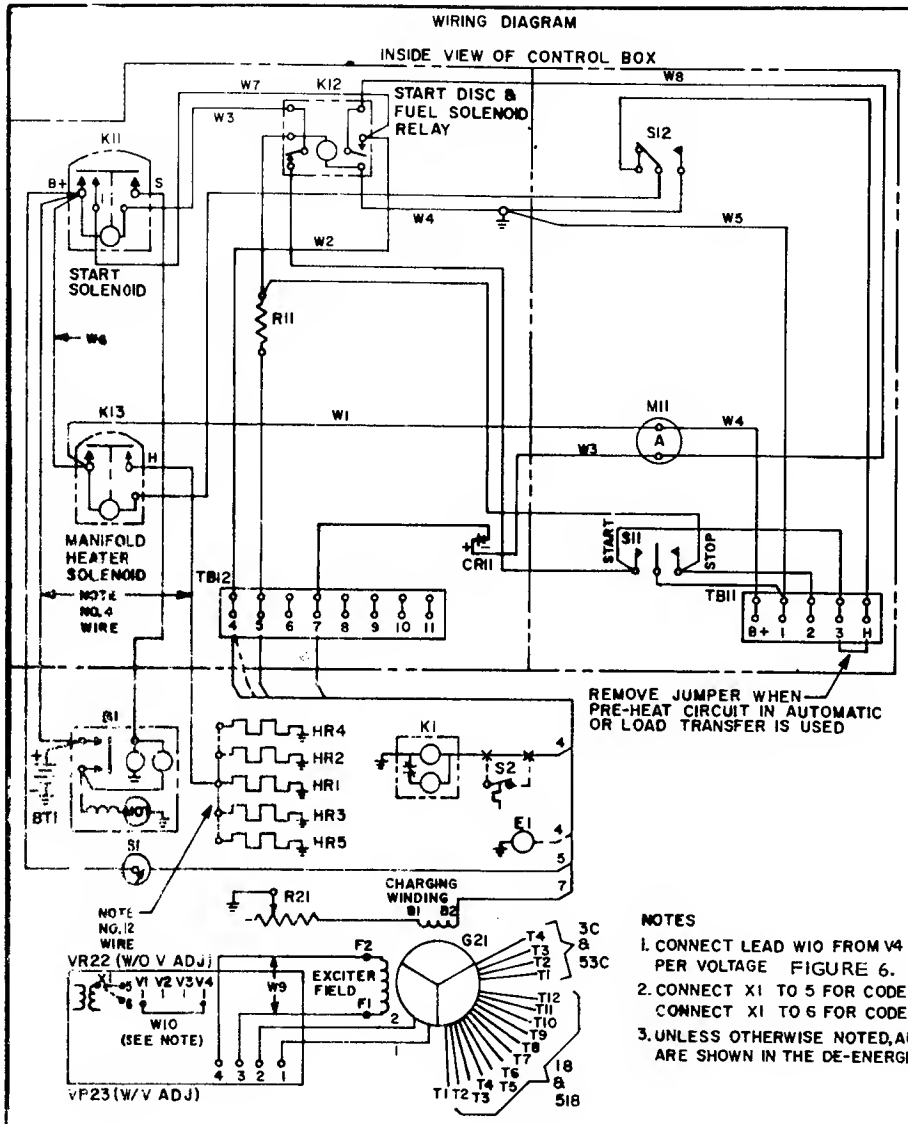
Onan DIVISION OF ST. JOE BAKER CORPORATION Minneapolis, Minnesota

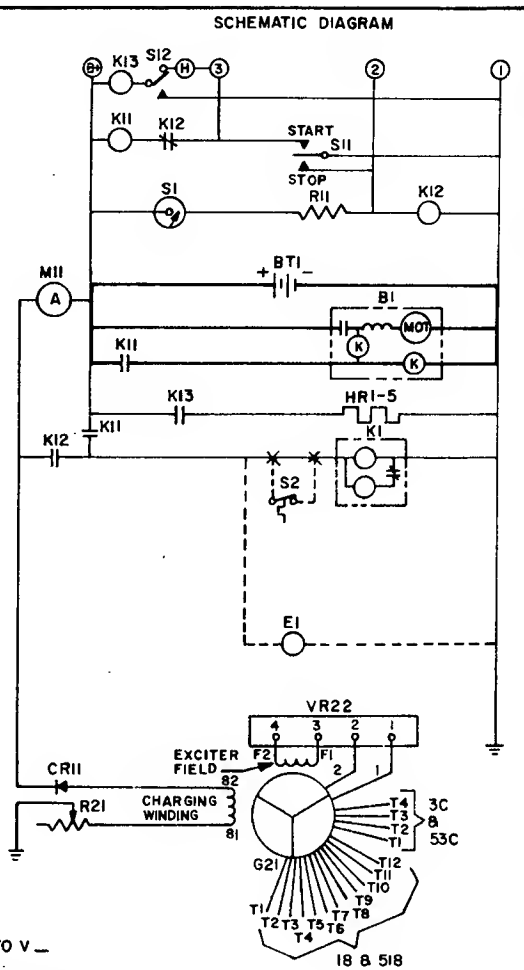
DATE 6-5-73 | DR. CIP | ENGR. GJK | CKD.

NAME CONTROL-GEN SET (WIRING DIAGRAM)

DWG. NO. 612-4792

DWG SIZE C





NOTES

1. CONNECT LEAD W10 FROM V4 TO V— PER VOLTAGE FIGURE 6.
2. CONNECT X1 TO 5 FOR CODE 53C & 518(50H2) CONNECT X1 TO 6 FOR CODE 3C & 18(60HZ)
3. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION.

PARTS LIST (REF)	
REF. DES.	DESCRIPTION
B1	STARTER & SOLENOID
BT1	BATTERY 12V
E1	FUEL PUMP *
HR1	HEATER-MANIFOLD
HR2,3	HEATER-GLOW PLUG (2 CYL)
HR2-5	HEATER-GLOW PLUG (4 CYL)
K1	SOLENOID-FUEL
S1	SWITCH-CENTRIFUGAL
S2	SWITCH-HIGH TEMP *
G21	GENERATOR
R21	RESISTOR ASSY
VR22	REGULATOR ASSY-VOLTAGE (W/O V ADJ) -01,-02
VR23	REGULATOR ASSY-VOLTAGE (W/V ADJ) -03,-04
W9	WIRING HARNESS (F1-F2)
CR11	RECTIFIER & LEAD ASSY
K11	RELAY-START SOLENOID
K12	RELAY-START DISC & FUEL SOLENOID
K13	RELAY-MANIFOLD HEATER
M11	AMMETER-CHARGE 5-0-5
R11,S11	SWITCH & RESISTOR ASSY
S12	SWITCH & LEAD ASSY
TB11	TERMINAL BLOCK
TB12	TERMINAL BLOCK
W1	LEAD ASSY
W2	LEAD ASSY
W3	LEAD ASSY
W4	LEAD ASSY
W5	LEAD ASSY
W6	JUMPER
W7	LEAD ASSY
W8	LEAD ASSY

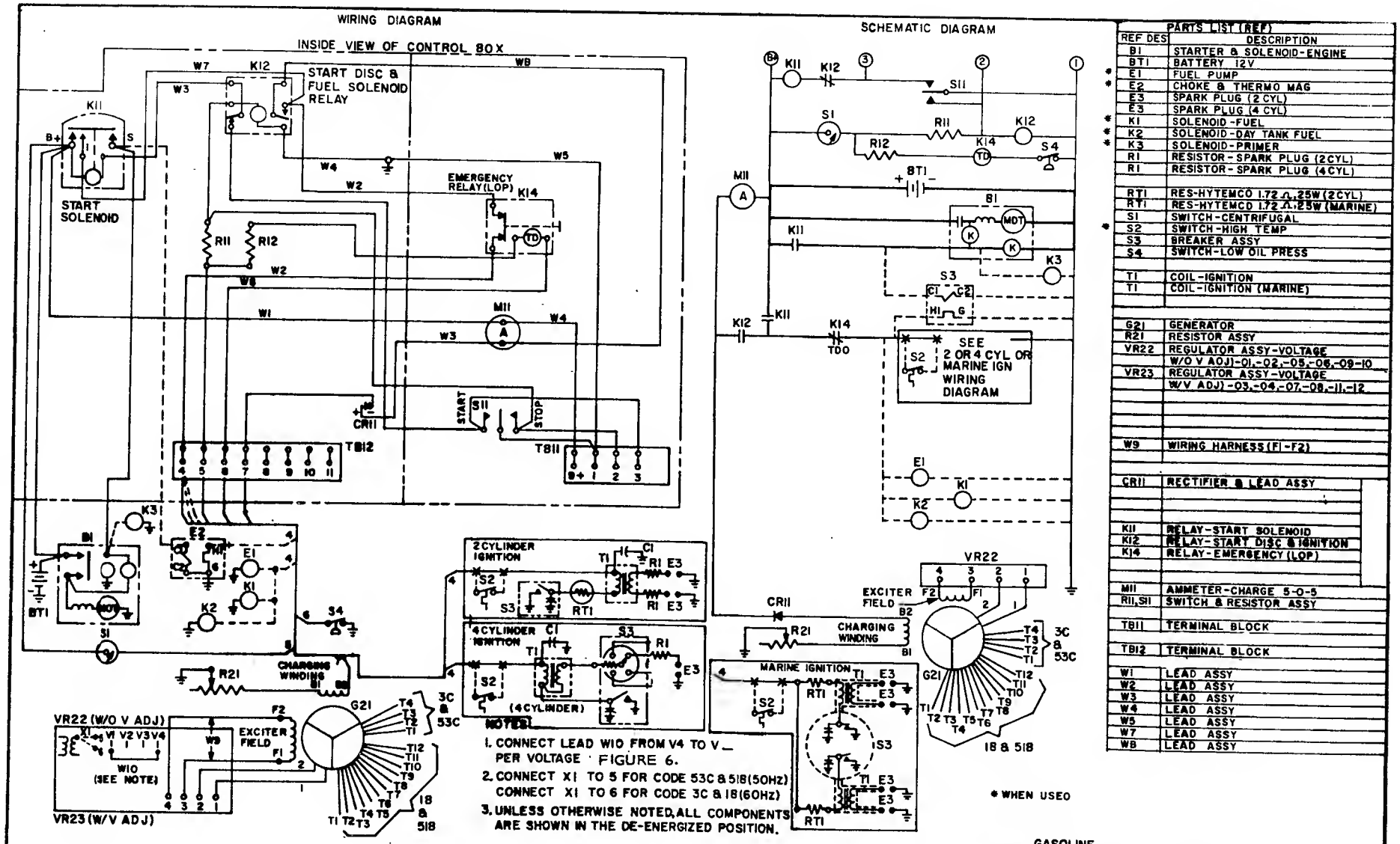
*WHEN USED

DIESEL

MODEL NO.	Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota			
4.5 & 9.0KW-53CR/IAA 4.5 & 9.0KW-518R/IAA 6.0 & 12.0KW-3CR/IAA 6.0 & 12.0KW-18R/IAA	DATE 6-5-73	DR. CIP	ENGR. GSK	CYR.
	NAME CONTROL-GEN SET (WIRING DIAGRAM)			
1&3 PH, 50 & 60HZ	DWG. NO 612-4791			DWG SIZE C

AIR-COOLED

DJB AND DJC MODELS



PARTS LIST (REF)	
REF DES	DESCRIPTION
B1	STARTER & SOLENOID-ENGINE
BT1	BATTERY 12V
E1	FUEL PUMP
E2	CHOKE & THERMO MAG
E3	SPARK PLUG (2 CYL)
E3	SPARK PLUG (4 CYL)
K1	SOLENOID-FUEL
K2	SOLENOID-DAY TANK FUEL
K3	SOLENOID-PRIMER
R1	RESISTOR-SPARK PLUG (2CYL)
R1	RESISTOR-SPARK PLUG (4CYL)
RT1	RES-HYTEMCO 1.72 Ω .25W (2CYL)
RT1	RES-HYTEMCO 1.72 Ω .25W (MARINE)
S1	SWITCH-CENTRIFUGAL
S2	SWITCH-HIGH TEMP
S3	BREAKER ASSY
S4	SWITCH-LOW OIL PRESS
T1	COIL-IGNITION
T1	COIL-IGNITION (MARINE)
G21	GENERATOR
R21	RESISTOR ASSY
VR22	REGULATOR ASSY-VOLTAGE W/O V ADJ)-01,-02,-05,-06,-09-10
VR23	REGULATOR ASSY-VOLTAGE W/V ADJ)-03,-04,-07,-08,-11,-12
W9	WIRING HARNESS(F1-F2)
CR11	RECTIFIER & LEAD ASSY
K11	RELAY-START SOLENOID
K12	RELAY-START DISC & IGNITION
K14	RELAY-EMERGENCY (LOP)
M11	AMMETER-CHARGE 5-0-5
R11,S1	SWITCH & RESISTOR ASSY
TB11	TERMINAL BLOCK
TB12	TERMINAL BLOCK
W1	LEAD ASSY
W2	LEAD ASSY
W3	LEAD ASSY
W4	LEAD ASSY
W5	LEAD ASSY
W7	LEAD ASSY
W8	LEAD ASSY

GASOLINE

MODEL NO.	
6.0-12.5KW-53CR/98AA	
6.0-12.5KW-518R/96AA	
7.5-15.0KW-3CR/96AA	
7.5-15.0KW-18R/96AA	
10.0-15.0KW-3CR/IAA	
10.0-15.0KW-18R/IAA	
MARINE	
183PH,50 & 60HZ	

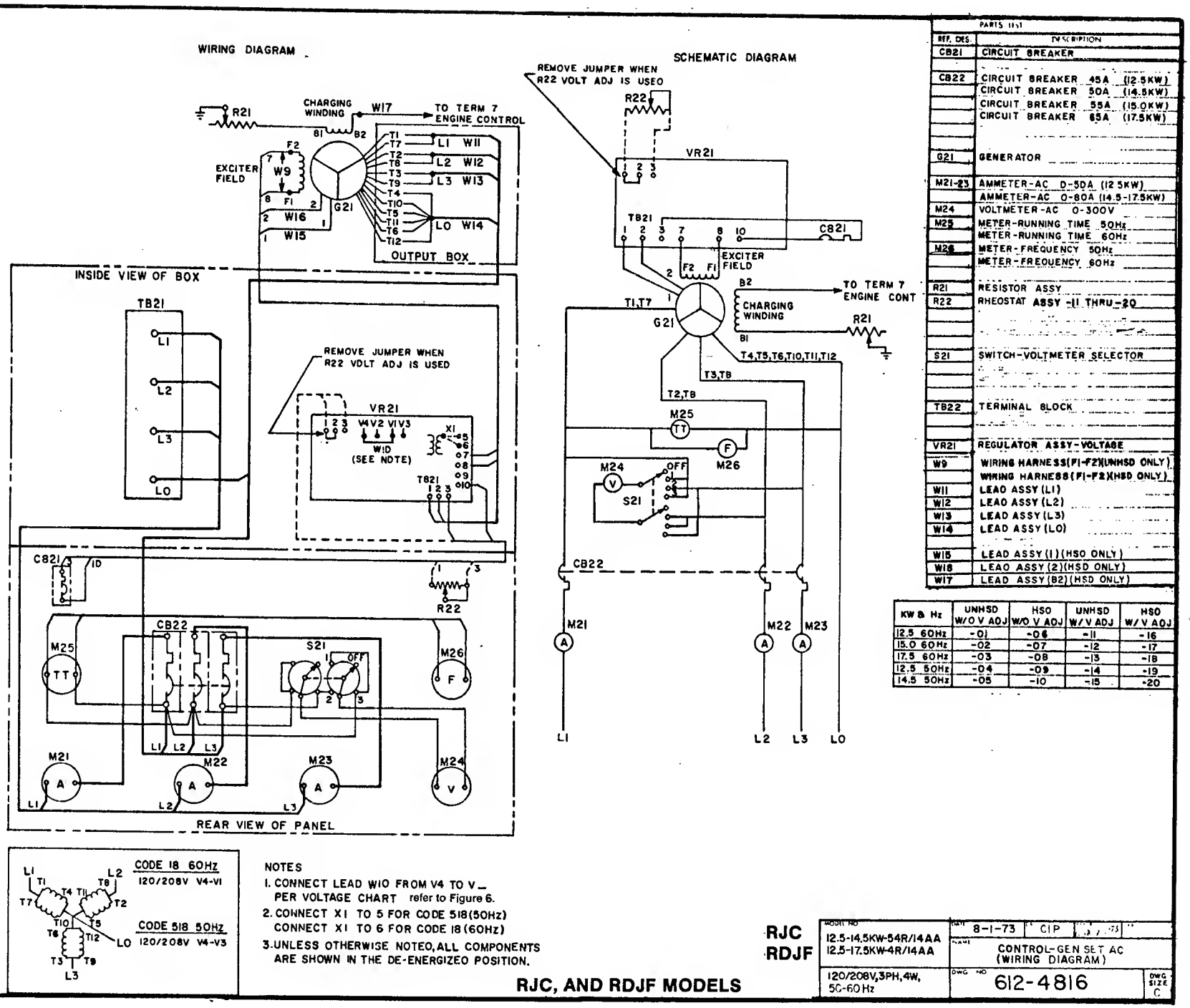
Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE 6-8-73 DR. CIP ENGR. GJK CKR.

NAME CONTROL-GEN SET (WIRING DIAGRAM)

DWG. NO. 612-4794 DWG SIZE C

JB, JC, AND MJC MODELS WITH LOW OIL PRESSURE SWITCH



PARTS LIST	
REF. DES.	DESCRIPTION
CB21	CIRCUIT BREAKER
CB22	CIRCUIT BREAKER 45A (12.5KW)
	CIRCUIT BREAKER 50A (14.5KW)
	CIRCUIT BREAKER 55A (15.0KW)
	CIRCUIT BREAKER 65A (17.5KW)
G21	GENERATOR
M21-23	AMMETER-AC 0-50A (12.5KW)
	AMMETER-AC 0-80A (14.5-17.5KW)
M24	VOLTMETER-AC 0-300V
M25	METER-RUNNING TIME 50Hz
	METER-RUNNING TIME 60Hz
M26	METER-FREQUENCY 50Hz
	METER-FREQUENCY 60Hz
R21	RESISTOR ASSY
R22	RHEOSTAT ASSY -1I THRU -20
S21	SWITCH-VOLTMETER SELECTOR
TB22	TERMINAL BLOCK
VR21	REGULATOR ASSY-VOLTAGE
W9	WIRING HARNESS(F1-F2)(UNHSD ONLY)
	WIRING HARNESS(F1-F2)(HSD ONLY)
W11	LEAD ASSY (L1)
W12	LEAD ASSY (L2)
W13	LEAD ASSY (L3)
W14	LEAD ASSY (LO)
W15	LEAD ASSY (1)(HSO ONLY)
W18	LEAD ASSY (2)(HSD ONLY)
W17	LEAD ASSY (82)(HSD ONLY)

KW & Hz	UNHSD W/O V ADJ	HSO W/O V ADJ	UNHSD W/V ADJ	HSO W/V ADJ
12.5 60Hz	-01	-06	-11	-16
15.0 60Hz	-02	-07	-12	-17
17.5 60Hz	-03	-08	-13	-18
12.5 50Hz	-04	-09	-14	-19
14.5 50Hz	-05	-10	-15	-20

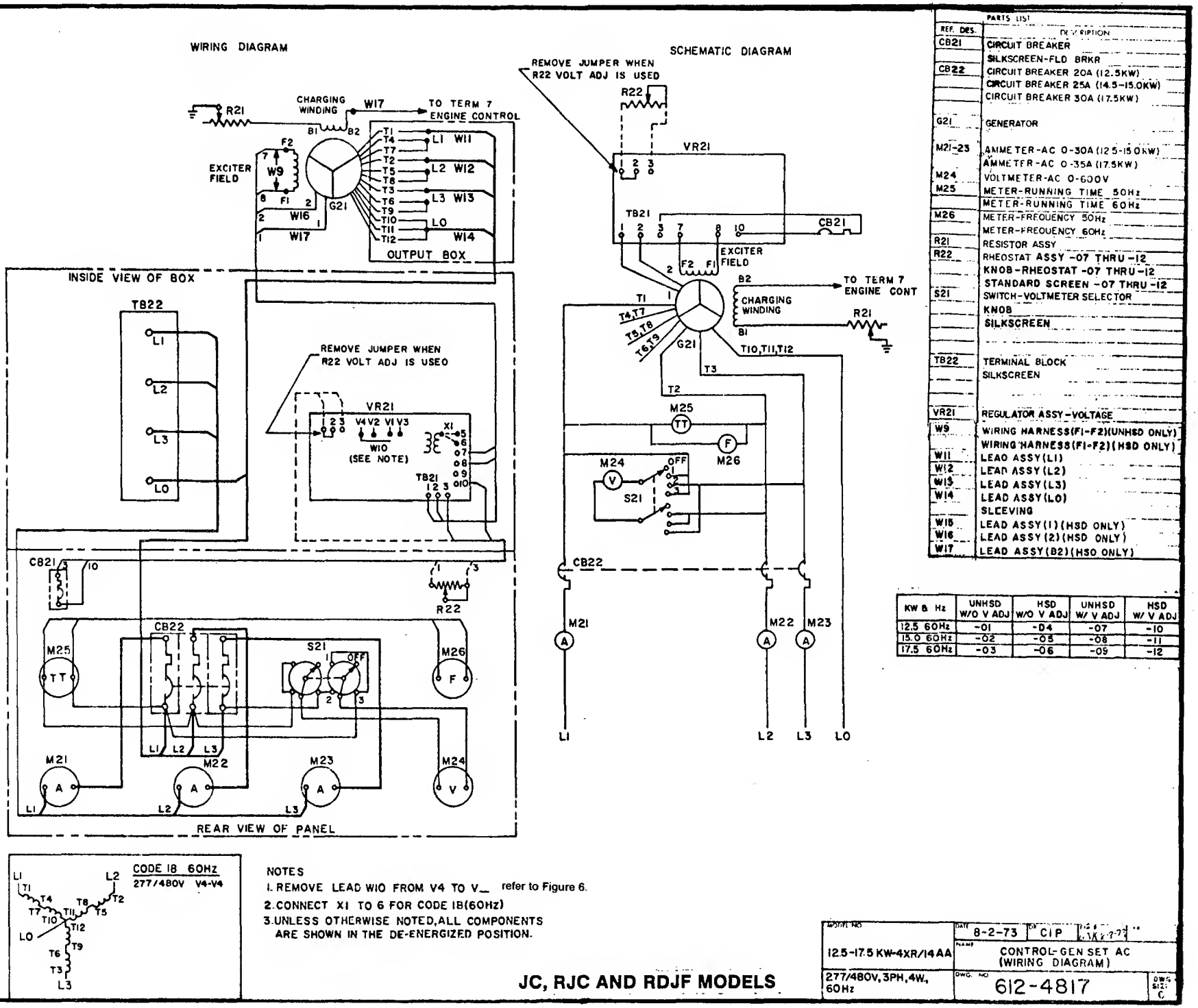
NOTES

1. CONNECT LEAD W10 FROM V4 TO V_ PER VOLTAGE CHART refer to Figure 6.
2. CONNECT X1 TO 5 FOR CODE 518(50Hz) CONNECT X1 TO 6 FOR CODE 18(60Hz)
3. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION.

RJC, AND RDJF MODELS

RJC
RDJF

MODEL NO	DATE	CIP
12.5-14.5KW-54R/14AA 12.5-17.5KW-4R/14AA	8-1-73	
120/208V,3PH,4W, 50-60Hz	NAME: CONTROL-GEN SET AC (WIRING DIAGRAM)	
	DWG NO: 612-4816	DWG SIZE C



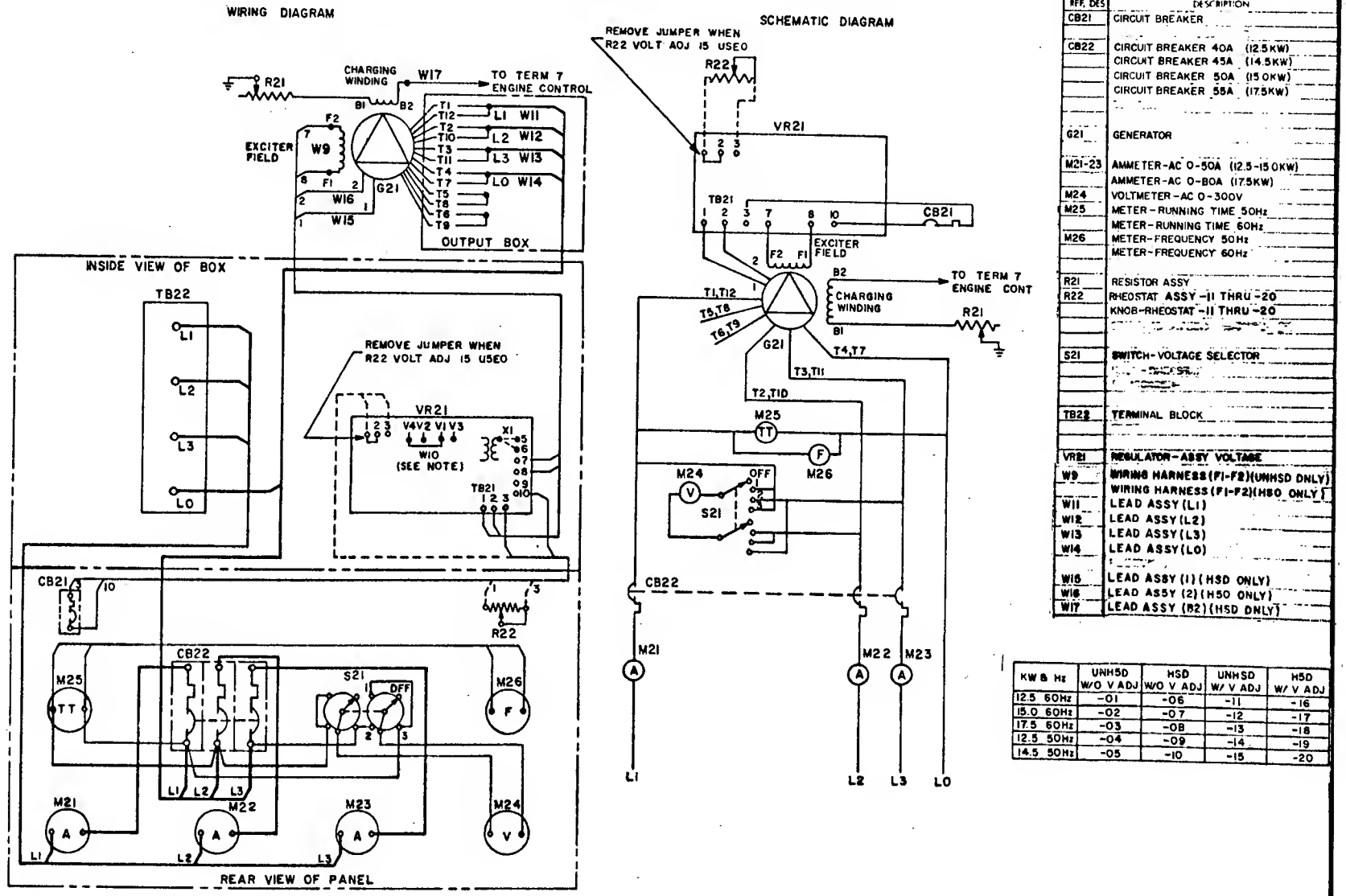
PARTS LIST	
REF. DES.	DESCRIPTION
CB21	CIRCUIT BREAKER
	SILKSCREEN-FLD BRKR
CB22	CIRCUIT BREAKER 20A (12.5KW)
	CIRCUIT BREAKER 25A (14.5-15.0KW)
	CIRCUIT BREAKER 30A (17.5KW)
G21	GENERATOR
M21-23	AMMETER-AC 0-30A (12.5-15.0KW)
	AMMETER-AC 0-35A (17.5KW)
M24	VOLTMETER-AC 0-600V
M25	METER-RUNNING TIME 50Hz
	METER-RUNNING TIME 60Hz
M26	METER-FREQUENCY 50Hz
	METER-FREQUENCY 60Hz
R21	RESISTOR ASSY
R22	RHEOSTAT ASSY -07 THRU -12
	KNOB-RHEOSTAT -07 THRU -12
	STANDARD SCREEN -07 THRU -12
S21	SWITCH-VOLTMETER SELECTOR
	KNOB
	SILKSCREEN
TB22	TERMINAL BLOCK
	SILKSCREEN
VR21	REGULATOR ASSY-VOLTAGE
W9	WIRING HARNESS(F1-F2)(UNHSD ONLY)
	WIRING HARNESS(F1-F2)(HSD ONLY)
W11	LEAD ASSY(L1)
W12	LEAD ASSY(L2)
W13	LEAD ASSY(L3)
W14	LEAD ASSY(L0)
	SLEEVING
W15	LEAD ASSY(1)(HSD ONLY)
W16	LEAD ASSY(2)(HSD ONLY)
W17	LEAD ASSY(B2)(HSD ONLY)

KW & Hz	UNHSD W/O V ADJ	HSD W/O V ADJ	UNHSD W/ V ADJ	HSD W/ V ADJ
12.5 60Hz	-01	-04	-07	-10
15.0 60Hz	-02	-05	-08	-11
17.5 60Hz	-03	-06	-09	-12

NOTES
1. REMOVE LEAD W10 FROM V4 TO V__ refer to Figure 6.
2. CONNECT X1 TO 6 FOR CODE 18(60Hz)
3. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION.

SYST. NO 12.5-17.5 KW-4XR/14AA	DATE 8-2-73 BY CIP	
277/480V, 3PH, 4W, 60Hz	NAME CONTROL-GEN SET AC (WIRING DIAGRAM)	
	DWG. NO 612-4817	DWG SIZE C

JC, RJC AND RDJF MODELS



NOTES

1. CONNECT LEAD W10 FROM V4 TO V_ PER VOLTAGE CHART refer to Figure 6.
2. CONNECT X1 TO 5 FOR CODE 518(50Hz) CONNECT X1 TO 6 FOR CODE 18 (60Hz)
3. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION.

PARTS LIST

REF. DES	DESCRIPTION
CB21	CIRCUIT BREAKER
CB22	CIRCUIT BREAKER 40A (12.5KW)
	CIRCUIT BREAKER 45A (14.5KW)
	CIRCUIT BREAKER 50A (15.0KW)
	CIRCUIT BREAKER 58A (17.5KW)
G21	GENERATOR
M21-23	AMMETER-AC 0-50A (12.5-15.0KW)
	AMMETER-AC 0-80A (17.5KW)
M24	VOLTMETER-AC 0-300V
M25	METER-RUNNING TIME 50Hz
	METER-RUNNING TIME 60Hz
M26	METER-FREQUENCY 50Hz
	METER-FREQUENCY 60Hz
R21	RESISTOR ASSY
R22	RHEOSTAT ASSY -11 THRU -20
	KNOB-RHEOSTAT -11 THRU -20
S21	SWITCH-VOLTAGE SELECTOR
TB22	TERMINAL BLOCK
VR21	REGULATOR-ASSY VOLTAGE
W9	WIRING HARNESS (F1-F2)(UNHSD ONLY)
	WIRING HARNESS (F1-F2)(HSD ONLY)
W11	LEAD ASSY (L1)
W12	LEAD ASSY (L2)
W13	LEAD ASSY (L3)
W14	LEAD ASSY (L0)
W16	LEAD ASSY (1) (HSD ONLY)
W16	LEAD ASSY (2) (HSD ONLY)
W17	LEAD ASSY (B2) (HSD ONLY)

KW & Hz	UNHSD W/O V ADJ	HSD W/O V ADJ	UNHSD W/ V ADJ	HSD W/ V ADJ
12.5 60Hz	-01	-06	-11	-16
15.0 60Hz	-02	-07	-12	-17
17.5 60Hz	-03	-08	-13	-18
12.5 50Hz	-04	-09	-14	-19
14.5 50Hz	-05	-10	-15	-20

Onan DIVISION OF STUDEBAKER CORPORATION

DATE 8-2-73 BY C.I.P. TRACED GTK 9-7-73

NAME CONTROL-GEN SET AC (WIRING DIAGRAM)

DWG NO 612-4818 DWG SIZE C

MODEL NO
12.5-14.5 KW-5SDR/14AA
12.5-17.5 KW-5DR/14AA

120/240V, 3PH, 4W Δ, 50-60 Hz

JC, RJC, AND RDJF MODELS

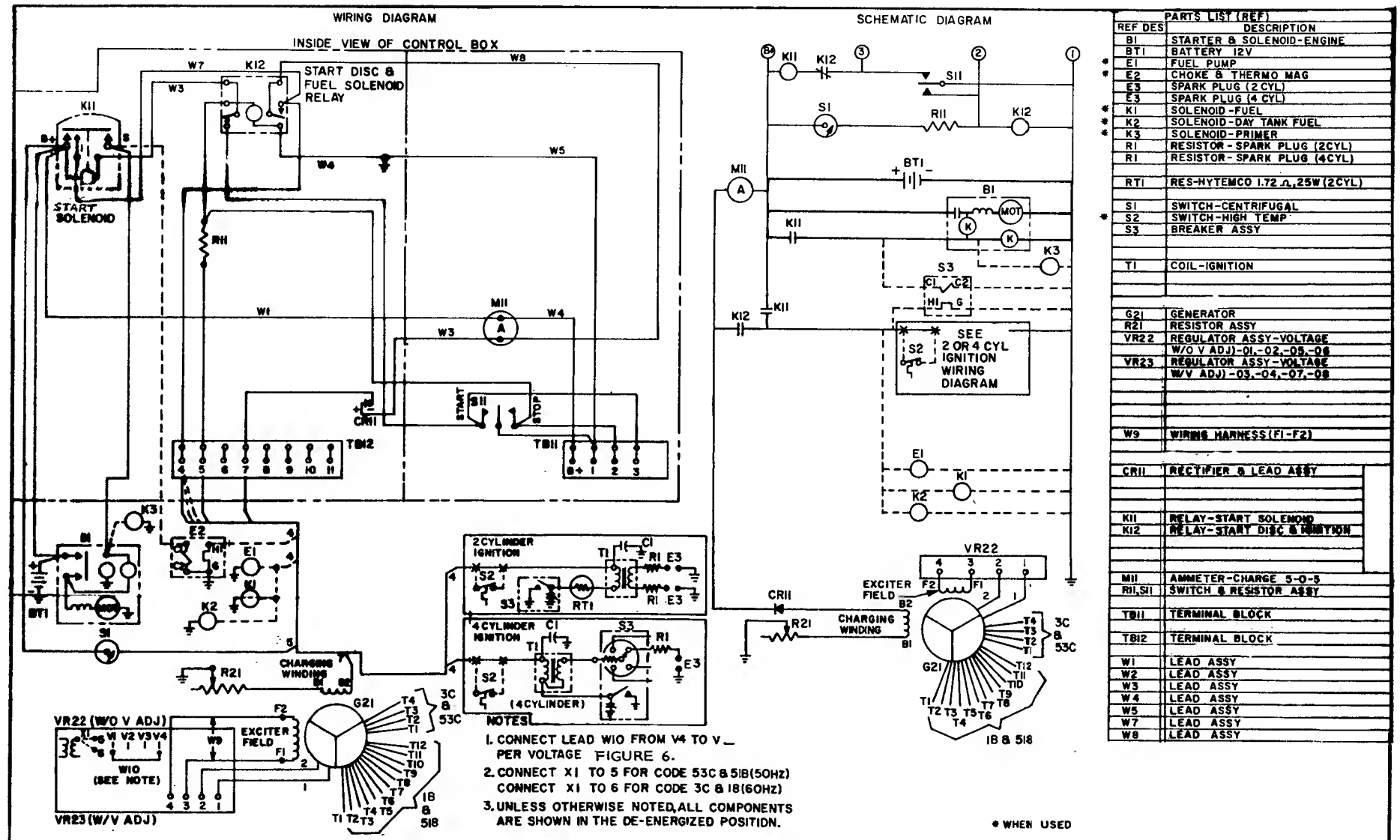


FIGURE 6.

PARTS LIST (REF)	
REF DES	DESCRIPTION
BI	STARTER & SOLENOID-ENGINE
BTI	BATTERY 12V
* EI	FUEL PUMP
* E2	CHOKE & THERMO MAG
E3	SPARK PLUG (2 CYL)
E3	SPARK PLUG (4 CYL)
* KI	SOLENOID-FUEL
* K2	SOLENOID-DAY TANK FUEL
* K3	SOLENOID-PRIMER
RI	RESISTOR-SPARK PLUG (2CYL)
RI	RESISTOR-SPARK PLUG (4CYL)
RTI	RES-HYTEMCO 1.72 Ω, 25W (2CYL)
SI	SWITCH-CENTRIFUGAL
* S2	SWITCH-HIGH TEMP
S3	BREAKER ASSY
TI	COIL-IGNITION
G2I	GENERATOR
R2I	RESISTOR ASSY
VR22	REGULATOR ASSY-VOLTAGE W/O V ADJ)-01,-02,-05,-06
VR23	REGULATOR ASSY-VOLTAGE W/V ADJ)-03,-04,-07,-08
W9	WIRING HARNESS (FI-F2)
CRII	RECTIFIER & LEAD ASSY
KII	RELAY-START SOLENOID
KI2	RELAY-START DISC & IGNITION
MII	AMMETER-CHARGE 5-0-5
RII, SII	SWITCH & RESISTOR ASSY
TBII	TERMINAL BLOCK
TBI2	TERMINAL BLOCK
WI	LEAD ASSY
W2	LEAD ASSY
W3	LEAD ASSY
W4	LEAD ASSY
W5	LEAD ASSY
W7	LEAD ASSY
W8	LEAD ASSY

GASOLINE

MODEL NO.	
6.0 - 12.5KW-53CR/IAA	
6.0 - 12.5KW-51BR/IAA	
7.5 - 15.0KW-3CR/IAA	
7.5 - 15.0KW-1BR/IAA	
183PH, 50 & 60HZ	

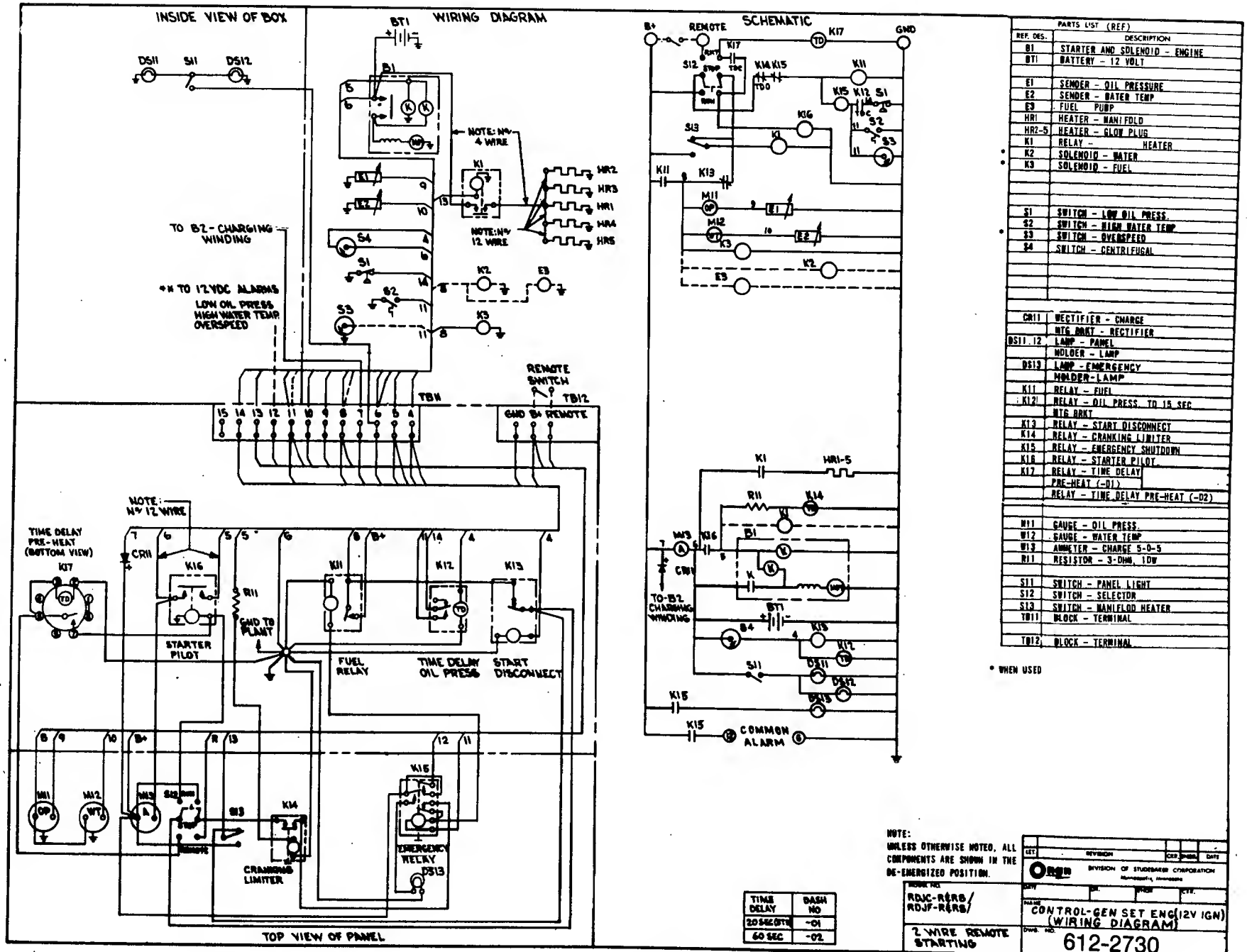
Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE 6-6-73 | DR. CIP | ENGR. ESK | CKD.

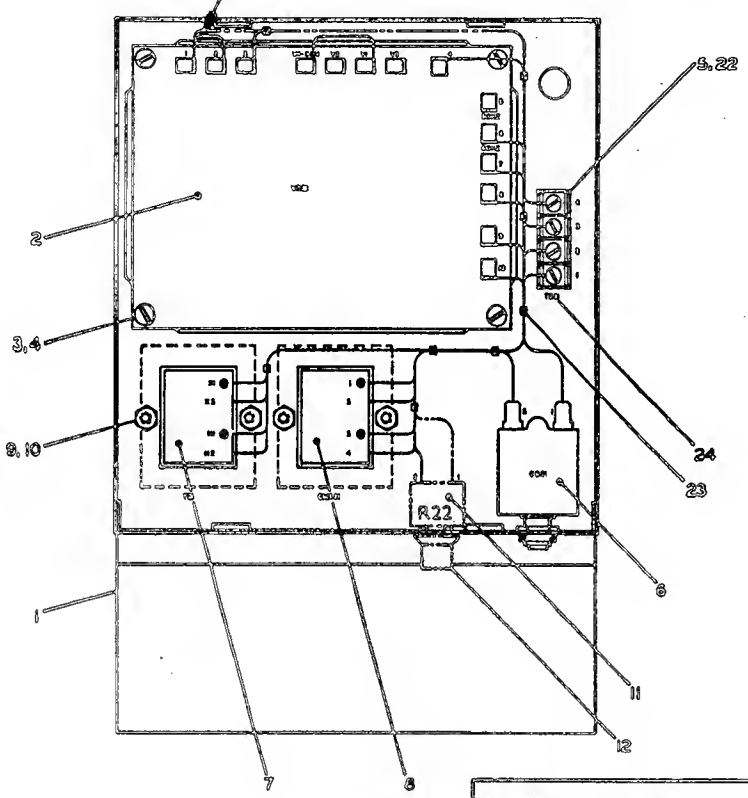
NAME CONTROL-GEN SET (WIRING DIAGRAM)

DWG NO 612-4793 | DWG SIZE C

AIR COOLED
JB AND JC MODELS

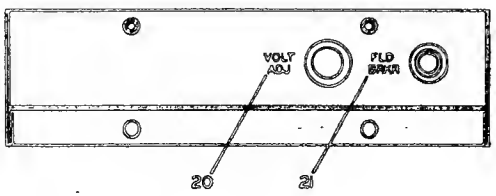

INSIDE VIEW OF BOX
WIRING DIAGRAM
SCHEMATIC
PARTS LIST (REF)
REF. DES. | DESCRIPTION
B1 | STARTER AND SOLENOID - ENGINE
BT1 | BATTERY - 12 VOLT
E1 | SENDER - OIL PRESSURE
E2 | SENDER - WATER TEMP
E3 | FUEL PUMP
HR1 | HEATER - MANIFOLD
HR2-5 | HEATER - GLOW PLUG
K1 | RELAY - HEATER
K2 | SOLENOID - WATER
K3 | SOLENOID - FUEL
S1 | SWITCH - LOW OIL PRESS.
S2 | SWITCH - HIGH WATER TEMP
S3 | SWITCH - OVERSPEED
S4 | SWITCH - CENTRIFUGAL
CR11 | RECTIFIER - CHARGE
| NTG BRKT - RECTIFIER
DS11,12 | LAMP - PANEL
| HOLDER - LAMP
DS13 | LAMP - EMERGENCY
| HOLDER-LAMP
K11 | RELAY - FUEL
K12 | RELAY - OIL PRESS. TO 15 SEC
| NTG BRKT
K13 | RELAY - START DISCONNECT
K14 | RELAY - CRANKING LIMITER
K15 | RELAY - EMERGENCY SHUTDOWN
K16 | RELAY - STARTER PILOT
K17 | RELAY - TIME DELAY
| PRE-HEAT (-01)
| RELAY - TIME DELAY PRE-HEAT (-02)
M11 | GAUGE - OIL PRESS.
M12 | GAUGE - WATER TEMP
M13 | AMMETER - CHARGE 5-0-5
R11 | RESISTOR - 3-OHM, 10W
S11 | SWITCH - PANEL LIGHT
S12 | SWITCH - SELECTOR
S13 | SWITCH - MANIFOLD HEATER
TB11 | BLOCK - TERMINAL
TB12 | BLOCK - TERMINAL
* WHEN USED
TIME DELAY | DASH NO
20 SEC | -01
60 SEC | -02
NOTE: UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION.
MODEL NO. RDJC-R6RB/ RDJF-R6RB/
2 WIRE REMOTE STARTING
DRAWING NO. 612-2730
CONTROL-GEN SET ENG (12V IGN) (WIRING DIAGRAM)
TOP VIEW OF PANEL
TO B2 - CHARGING WINDING
TO 12 VDC ALARMS
LOW OIL PRESS
HIGH WATER TEMP
OVERSPEED
REMOTE SWITCH
TB11
TB12
TIME DELAY PRE-HEAT (BOTTOM VIEW)
STARTER PILOT
FUEL RELAY
TIME DELAY OIL PRESS
START DISCONNECT
CRANKING LIMITER
EMERGENCY RELAY
COMMON ALARM
TO B2 CHARGING WINDING

REMOVE JUMPER WHEN VOLTAGE ADJUST R22 IS USED FOR REFERENCE VOLTAGE REGULATION.



WIRING TABULATION		
FROM STATION NO.	TO STATION NO.	LEAD FIND NO.
T21-X1	VR21-6	
T21-X2	VR21-4	
T21-H1	TB21-1	
T21-H2	TB21-2	
CBR21-1	CB21-2	
CBR21-2	TB21-1	
CBR21-3	TB21-3	
CBR21-4	VR21-5	
CB21-1	VR21-10	17
TB21-3	VR21-8	19
TB21-4	VR21-7	18
VR21-V6 COM	VR21-V1	16
VR21-1	VR21-2	18
222-2	VR21-1	
222-1	VR21-3	

TABULATION									
VOLTAGE REGULATOR ASSY PART NO.	ITEM 11 RHEOSTAT ASSY PART NO.	ITEM 12 ROD-RHEOSTAT PART NO	ITEM 13 PLUG-DOT BUTTON PART NO	ITEM 14 SCREW-RHD (6-40 x 1-4) PART NO.	ITEM 15 WASHER-ET LK (#6) PART NO.	ITEM 16 NUT-HEX (6-40) PART NO.	ITEM 17 LEAD ASSY QTY	ITEM 20 SILKSCREEN PART NO.	
309-0532	NONE	NONE	917-9809	013-9027	093-9081	006-9950	2	NONE	
309-0533	389-0189	389-104	NONE	NONE	NONE	NONE	1	90-9081	



24	90-2609	A	1	SILKSCREEN-TB21
23	332-0042	P	8	TIE-CABLE (SELF LOCKING)
22	332-1648	P	2	CLIP-RETAINING
21	90-2608	A	1	SILKSCREEN-FLD BRKR
20	SEE TAB	A	1	SILKSCREEN-VOLT ADJ
19	336-2231	A	MAR	LEAD ASSY
18	336-2236	A	2	LEAD ASSY
17	336-2239	A	1	LEAD ASSY
16	SEE TAB	-	1	NUT-HEX (4-40)
15	SEE TAB	-	1	WASHER-ET LK (#6)
14	SEE TAB	-	1	SCREW-RHD (4-40 x 3/8 LG)
13	SEE TAB	P	1	PLUG-DOT BUTTON
12	SEE TAB	-	1	ROD-RHEOSTAT
11	SEE TAB	A	1	RHEOSTAT ASSY
10	912-0030	-	4	SCREW RHD (6-32 x 1" LG)
8	970-0150	-	4	NUT-HEX U'ET (6-32)
6	315-0381	E	1	REACT-COIL
7	319-0308	E	1	TRANSFORMER-VOLT REF
5	320-0505	P	1	CIRCUIT BREAKER
3	332-1847	P	1	TERMINAL STRIP
4	093-0003	-	4	WASHER-ET LK (#8)
2	919-9186	-	4	SCREW-AN THD CTG (6-32 x 3/8)
9	309-1080	B	1	REGULATOR BOARD ASSY
1	381-3713	B	1	PANEL-VOLT REGLTR MTG

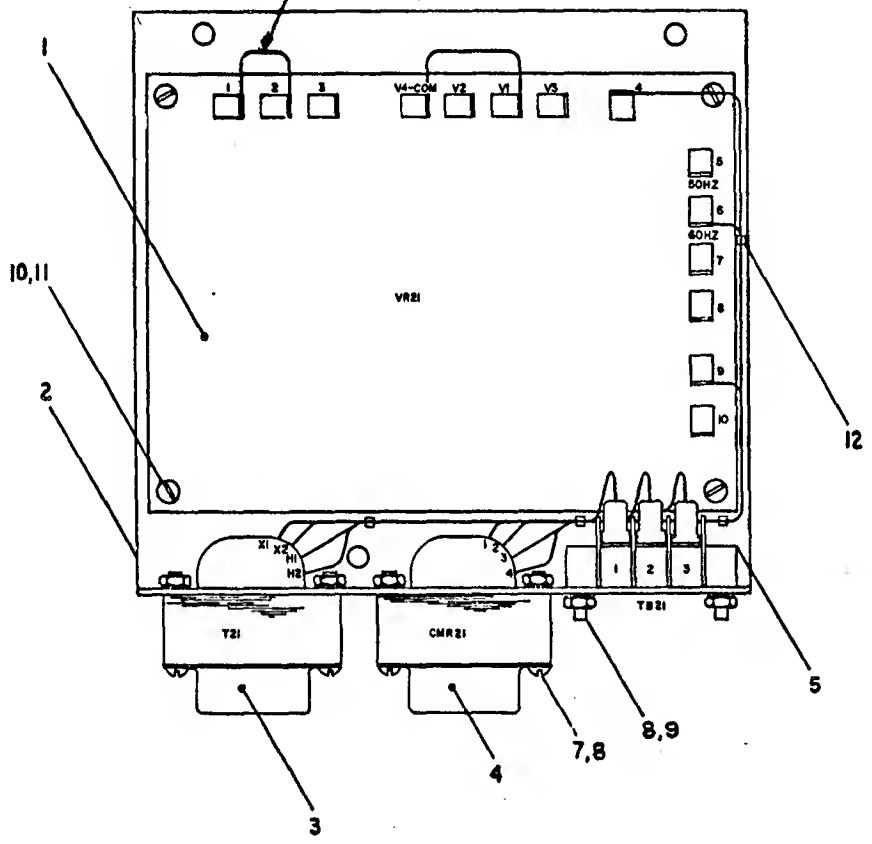
SYMB	PROV NO.	REV	QTY	CAGE	DESCRIPTION OR MATERIAL
	50				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

APP 10-21-75 | 1/5 | REGULATOR ASSY-VOLTAGE

YD | 305-0532 | 305-0533 | D

AIR-COOLED AND MARINE SETS

REMOVE JUMPER WHEN VOLTAGE ADJUST R22
IS USED FOR REFERENCE VOLTAGE REGULATION.



WIRING TABULATION		
FROM STATION NO.	TO STATION NO.	LEAD FIND NO.
T21-X1	VR21-6	
T21-X2	VR21-4	
T21-H1	TB21-1	
T21-N2	TB21-2	
CMR21-1	TB21-3	
CMR21-2	TB21-1	
CMR21-3	TB21-2	
CMR21-4	VR21-9	
VR21-1	VR21-2	13
VR21-V4 COM	VR21-V1	13

13	336-2231	A	2	LEAD ASSY
12	332 0942	P	4	TIE-CABLE (SELF LOCKING)
11	653-0003	–	4	WASHER-ET LK (#6)
10	612-0061	–	4	SCREW-RHM (6-32 x 3/8" LG)
9	612-0063	–	2	SCREW-RHM (6-32 x 1 1/2" LG)
8	670-0163	–	6	NUT-HEX W ET (6-32)
7	612-0068	–	4	SCREW-RHM (6-32 x 1" LG)
6				
5	332-1855	A	1	TERMINAL STRIP
4	315-0391	C	1	REACT-COMM
3	315-0368	C	1	TRANSFORMER-VOLTAGE REF
2	301-3716	C	1	PANEL-VOLT RGLTR MTG
1	300-1006	D	1	REGULATOR BOARD ASSY

6-19-79 1/1

REGULATOR ASSY-VOLTAGE

YD

305-0534

RADIATOR COOLED

Onan®

PRODUCT SUPPORT BULLETIN NO. 104
SERVICE/PARTS/PUBLICATIONS

DATE Feb. 6, 197(

SUBJECT: GENERATOR WIRING AND CONNECTION DIAGRAMS FOR "YD" SERIES GENERATORS

REF. FILE# S-67

MODEL(S) or SERIES:
TWO AND FOUR CYLINDER "J"-SERIES
OPERATOR'S MANUAL (BEGINNING SPEC AA)

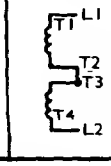
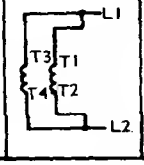
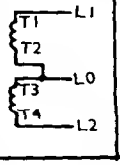
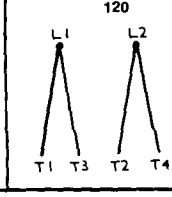
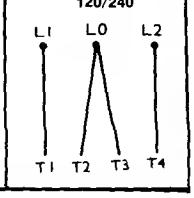
EFFECTIVE: IMMEDIATELY

Some confusion exists on several generator wiring and connection diagrams concerning reconnection for 120/240 volt, single phase.

On some of these diagrams the 240 volt connection was labelled as 120 volts, and the 120 volt connection was labelled as 240 volts. Use this portion of the chart (see below) in place of existing portion of the chart in the following manuals:

MANUAL NUMBER	MODEL OR SERIES	PAGE
900-0184	"YD" Generator Service Manual (Section 7, Master Service Manual 922-0500)	6
929-0004	"YD" two-bearing Alternator Manual	9
967-0120	"JC" Operator's Manual	10
967-0122	"DJC" Operator's Manual	11
968-0120	"MDJE" Operator's Manual	13
968-0121	"MDJF" Operator's Manual	11
968-0340	"MJC" Operator's Manual-Page 4 of Supplement 900-0190	
968-0341	"MDJC" Operator's Manual	13
974-0120	"RJC" Operator's Manual	11
974-0121	"RDJC" Operator's Manual	13
Misc. 9	Service Bulletin	8

GENERATOR WIRING AND CONNECTION DIAGRAMS

NAMEPLATE VOLTAGE CODE	VOLTAGE	PHASE	FREQUENCY	CONNECT W/O JUMPER WIRE FROM V4 TO:	GENERATOR CONNECTION	GENERATOR CONNECTION SCHEMATIC DIAGRAM			LOAD TO GENERATOR CONNECTION WIRING DIAGRAM (CONNECT X1 TO VR21-5 FOR 50 HERTZ AND X1 TO VR21-6 FOR 60 HERTZ GENERATORS.)		
						240	120	120/240	240	120	120/240
3C	120/240	1	60	V1							
53C	120/240	1	50	V3							
	115/230	1	50	V2							
	110/220	1	50	V1							

NOTE: Extra copies are available upon request. This bulletin is for informational purposes.